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Symposium on the History of American Medicine

Part II

Medicine in the Era of the American Revolution — William Pepperrell Norwood

The Lessons of the War between the States — Courtney R. Hall

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SYMPOSIUM ON THE HISTORY OF AMERICAN MEDICINE

PART II

Medicine in the Era of the American Revolution

William Frederick Norwood, Ph.D.

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John Adams remarked that the American Revolution took place "in the minds and hearts of the people" before the first shots were fired on Lexington Common. His lifelong friend and correspondent, Dr. Benjamin Rush, declared in 1783, two years after Yorktown, "The American war is over but this is far from being the case with the American Revolution." These were not conflicting statements, even though Adams was a Federalist and Rush a Republican. It was apparent to both men that the Revolution and the war were not one and the same. Rush merely meant that, the war being over, the stage was set for the shaping of a new social and political order based on the principles for which they had fought.[1]

The vicissitudes of colonial life and commerce had wrought changes in thought and action that culminated in the armed conflict. From the accession of William and Mary (1689) to the fall of Quebec (1763), New France exerted continuous pressure on English America. Hit-and-run engagements between English and French forces in America reflected the greater conflict then in progress in Europe. The English colonies, more or less geographically isolated and founded under a variety of legal instruments, drifted into the virtues and vices of provincialism before the "Gallic peril" strongly suggested intercolonial cooperation. Seven colonies sent delegates to the Albany Congress in 1754, which adopted but never implemented Benjamin Franklin's proposal for a federal council. The French and Indian War (1754–1763) convinced the colonial leaders of the value of cooperation. The provincial legislatures, with some pride and air of independence, appropriated sums for military purposes, granted supplies to British forces, and supervised their own

Part I of this Symposium appeared in the June issue; part III will be published in the August issue.

colonial militia. Further, they observed that their own men commanded by colonial officers proved to be the equal of British regulars.

The French and Indian War was but a dress rehearsal for the Continentals. Only the problem of French aggression had been settled. A flush of inflation created by the war was followed by a business recession. An unstable economy was further threatened by England's clumsy handling of problems related to revenue, trade, and the organization of the West. Legislative acts and the Ministry's orders brought on the Boston Massacre, organization of radicals, Boston Tea Party, the Continental Congresses, and the curtain raiser at Lexington and Concord in 1775.

The years after Cornwallis' surrender at Yorktown (1781) were fraught with confusion and conflicting concepts. A fictitious war prosperity, collapsing within a year after the war ended, complicated the "critical years"—1781–1789. Legislators struggled manfully to govern under the inadequate *Articles of Confederation*. Stable principles of government for the fledgling republic were not fashioned until the Constitutional Convention met in Philadelphia in May, 1787. After a warm summer made warmer by heated debates and compromise, Gouverneur Morris added literary polish to the document that became the *Constitution* of the United States in 1789.

The last decade of the century was the time for harness-breaking a new government administration to its constitution and bill of rights. Crucial foreign and domestic problems brought into sharp contrast the views of Federalists and Republicans. A political revolution marked the turn of the century. Lacking unity, the Federalists declined and finally lost their potency, while under Thomas Jefferson's guidance, the Republicans (Democrats to twentieth century partisans) achieved national leadership. Young America with its two party system and fabulous prospects was on its way.

Adams and Rush were right. The American Revolution was not merely seven or eight years of military conflict. When a human constitutional disorder is treated surgically, the patient's history, physical findings, and surgical exploration frequently reveal that pathological changes have long been in progress. Likewise, postsurgical care and convalescence are subject to complications that may persist for long periods. Evidences of the American Revolution in the social structure "preoperatively" and "postoperatively" are discernible for a full half century.

This 50 year period is a convenient span for a candid examination of medicine and the medical profession during the time of the American Revolution. For purposes of presentation we will divide the era vertically into three periods: before, during, and after the years of military action.

BEFORE LEXINGTON AND CONCORD

The most revealing and critical contemporary view of American medicine during the third quarter of the eighteenth century is Dr. John Morgan's fervid and insinuating two day commencement address at the College of Philadelphia, May 30-31, 1765. Morgan had just returned from Europe in April, after five years of medical study and travel. Previously he had engaged in medical practice after serving a period of apprenticeship in Philadelphia. On his recommendation and that of Dr.

William Shippen, Jr., and others in Philadelphia, the College trustees had already decided to establish a medical department. Indeed they had named John Morgan professor of the theory and practice of medicine, the first such appointment in the history of American medicine.

Morgan had arrived in Philadelphia with an M.D. degree from the University of Edinburgh, membership in the College of Physicians of Edinburgh, and a license from the College of Physicians of London. Further, he had collected professional honors in Paris and Rome and had with him emphatic recommendations from Thomas Penn and two former trustees who were then living in England.

Although medical instruction did not begin until the fall, Morgan's address was virtually the inauguration of the new venture, and no American institution was better suited to mother the new undertaking. The College of Philadelphia, unlike its contemporary institutions such as Harvard and Yale, had departed from the classical theological design by offering, like the *Realschulen*, such practical subjects as mathematics, surveying, navigation, and accounting. Mechanics, physics, chemistry, agriculture, natural history, history, civics, ethics, government, trade, commerce, and international law were also added, ". . . and finally for the wordly wise and curious," as the Beards put it, "training in modern languages" was instituted.[2] The principal organizer of this broadly based college was none other than Benjamin Franklin, who, with a coterie of cosmopolitan thinkers, had first projected the institution as the Philadelphia Academy, which admitted its first class in 1751.

When the 30 year old Morgan, clad in a professorial robe, stepped to the rostrum, it was apparent that a home town boy had made good in Europe. Perhaps less apparent was the fact that American medicine had taken its first step toward becoming a university discipline.

Dr. Morgan addressed himself to the "Trustees of the College and the Citizens of Philadelphia." Since the trustees were a party to the new proposal, the speaker obviously hoped to influence the general public in his audience, among whom were physicians and a concourse of leading citizens. In this double-barreled public address, Morgan classified the branches of medical science, stressed preprofessional education, described the general state of medicine in America, and emphasized the "effects of ignorant and presumptuous practice." Also he reviewed the circumstances favoring the establishment of a medical school and the advantages to be expected therefrom. He recommended that physic and chirurgery be separated in practice and that the dispensing of drugs be reserved to the apothecary. In conclusion, he counseled prospective students and encouraged trustees.[3]

Dr. Morgan's criticism of the American medical profession and the current mode of practice was packed with biting sarcasm. Franklin's newspaper, making note of the discourse, declined to comment on its contents inasmuch as it was soon to be published *in toto*. The press added that ". . . the perspicuity with which it was written and spoken drew the close attention of the audience, and particularly of the gentlemen of the Faculty of Physic."

William Shippen, Jr., M.D., was probably in the audience. He too was preceptorially trained in Philadelphia and had graduated in medicine at Edinburgh. When he returned in 1762 he brought with him a gift of anatomical drawings and casts

for the Pennsylvania Hospital from London's wealthy practitioner, John Fothergill. It was understood that Dr. Shippen would use these visual and manual aids in anatomical instruction. Dr. Fothergill's letter of transmittal anticipated Dr. Morgan's return and suggested his and Dr. Shippen's mutual commitment " . . . to erect a school of physic amongst you." Dr. Shippen's last month at Edinburgh was Dr. Morgan's first. Undoubtedly they had discussed such a project. On his return, Dr. Shippen gave informal instruction in practical anatomy and lectured in midwifery to practitioners and interested laymen.[4] In his address Dr. Morgan rated Dr. Shippen's lectures as "not . . . at all a collegiate undertaking," but patronizingly recommended him for a professorship in anatomy. Dr. Shippen's father was a physician and one of the college trustees, but William had been sent to New Jersey College (Princeton). It may have been for this reason that a College of Philadelphia alumnus, John Morgan, was favored for the commencement address. The incident marked the beginning of lifelong professional conflict and jealousy between two very able men. Dr. Shippen was soon offered the chair in anatomy and accepted it with the explanation that he too had proposed (1762) the teaching of medicine in all its branches during a public oration introductory to his first course in anatomy and that he had waited long for Dr. Morgan, to whom he communicated his plan in England.[5]

In his address, John Morgan emphasized the place of hospitals in medical education. He doubtless had in mind the Pennsylvania Hospital founded in 1750 and the Philadelphia Hospital, erected as the Philadelphia Almshouse in 1732, with an infirmary for the sick and insane indigents. Pennsylvania Hospital, although it took charity patients, was planned as a general hospital to serve solvent citizens and transients as well.[6] Dr. Thomas Bond, who had originally proposed the Pennsylvania Hospital, suggested to its managers, in 1766, the propriety of offering clinical lectures. The managers approved, and Dr. Bond's lectures, from 1767 to 1784, were virtually a part of the College of Philadelphia curriculum, although he never received a professorial appointment.

At the request of Drs. Morgan, Shippen, and the medical trustees, Provost William Smith of the College began a course of lectures on natural and experimental philosophy in 1766, offered gratis to medical students who sensed the need "of completing themselves in the languages and any parts of the mathematics at their leisure hours."

In 1768, Dr. Adam Kuhn, who had studied under Cullen at Edinburgh, was appointed at his request to the chair of botany and materia medica. In the summer of 1769, Dr. Benjamin Rush returned from study abroad to the chair of chemistry. He soon became one of the most influential physicians in America. The system of medicine he ultimately propounded dominated the profession well past the turn of the century.

Lectures in anatomy by Dr. Samuel Clossy, a graduate of Trinity College, Dublin, began in New York City in 1763, and were later incorporated in King's College medical school, founded in 1767. Dr. Peter Middleton, a Scotsman, received an honorary M.D. degree in 1768 and became the school's first professor of physiology and pathology. The chair in chemistry went to Dr. James Smith, a Leyden graduate, and midwifery was in the hands of the skilled R. John V. B. Tennent, an Edin-

burgh graduate. Dr. Samuel Bard, also an Edinburgh graduate, presided over theory and practice. He promoted the medical theories of the well-known British clinician, William Cullen.[7] The New York Hospital was established in 1775 and played an important role in medical education.

The two terms required in these pioneer American medical schools were looked on as a supplement to and not a substitute for the prevailing apprenticeship system of medical education. The medical apprenticeship in England was commonly seven years in length, patterned somewhat after the guild systems, while in America it was usually three years but sometimes longer. In the eighteenth century in England, an increasing number of Britishers began entering medicine by way of university study, which did not prescribe apprenticeship other than hospital study. The University of Edinburgh, more than any other institution, became the mecca of American youth who sought institutional medical instruction and were financially able to study abroad.

The English medical schools generally required a B.A. degree for admission, but Edinburgh was less strict, being satisfied with some competence in Latin, natural history, and related areas. Three years of lectures and a dissertation were prerequisite to the M.D. degree. Perhaps the less rigid admission standards and an emphasis on clinical instruction are the reasons that Americans favored Edinburgh during this period.

Few American youths studied in Europe prior to 1750, but an increasing number of young men went abroad thereafter, not a few of whom had completed three or more years of apprenticeship and had some experience in independent practice. Intelligent young Americans with an extensive practical background had little difficulty distinguishing themselves at Edinburgh. One hundred and twelve earned the M.D. at Edinburgh before the turn of the century, and an equal number studied in this Scottish university without continuing long enough to graduate. Other medical schools, British and continental, were patronized to a lesser degree.[8]

John Morgan was to an extent correct in describing colonial medical practice as ignorant and presumptuous. But he was wrong if he thought that American physicians were ready to segregate themselves as medical or surgical in practice, with the surgeons adding the compounding of drugs to their zone of professional activity wherever apothecaries were not operating. The very nature of medical practice in a pioneer society decreed that general practice become a long-lasting American tradition, even in the cities.

The number of American physicians at the close of the antebellum quarter century has been estimated at 3500. According to this rough estimate, no more than 400 of these men held the M.D. degree and only about 50 of them were graduated from the two American schools.[9] The majority were a heterogeneous group. Among them were self-styled physicians, clerics, barbers, butchers, magistrates, and anyone who, by choice or under fortuitous circumstances, entered upon a practice of the healing art, although usually with some preceptorial training. The rugged life of the colonies, particularly on the frontier, made absolute demands on any man who passed as a healer. Only one specialty retained its identity—obstetrics, which was almost entirely in the hands of midwives.

Although sporadic efforts were made to form local medical societies as early as 1735, the first enduring society was the New Jersey Medical Society, which was formed in 1766 but suspended its activities during the Revolution. It was a voluntary organization of the principal practitioners of the state, founded without legislative supervision or protection. The contact of New Jersey physicians with British military surgeons during the French and Indian War is said to have provided some of the stimulus that led to organization of this society. At Duff's Tavern on July 23, 1766, 16 charter members elected Robert McKean of Perth Amboy their first president.[10]

In spite of the great variety of background of American practitioners and the adulterations from Indian and folk remedies, American medicine in this quarter century reflected the medicine of Europe, especially that of England and Scotland, which in turn reflected the continental influence. Books and journals were imported, and a few native papers and books reached the press. The system of Boerhaave was dominant throughout most of the eighteenth century. During the third quarter, Cullen's purely theoretical pathology and nosology gained some recognition. Physicians with collections of literature of any size were familiar with Van Swieten, Haller, Cowper, Cheselden, Pott, Smellie, Sydenham, Mead, et al.

American physicians and a few laymen who attempted to contribute to medical literature at this time deserve recognition for their efforts rather than for originality or notably useful contributions. The most practical monograph was John Jones' *Plain, Precise, Practical Remarks on the Treatment of Wounds and Fractures* because it was used widely by American army physicians. According to John Shaw Billings, this work had but one original observation, viz., a case of trephining followed by hernia cerebri.[11] The subject matter of these contributions indicates that they were much concerned with epidemics of smallpox, yellow fever, diphtheria, and the common run of fevers, fractures, and miscellaneous miseries.

THE WAR YEARS

On March 5, 1770, mutual ill feeling culminated in the Boston Massacre. Trigger-happy redcoats fired on a swaggering, insolent, and threatening mob, which was using sticks, stones, snowballs, and abusive language to the discomfort of the soliders. From that time on, until shots were exchanged on the Lexington green in April, 1775, the Whig-minded colonists engaged the mother country in a cold war. The tension, especially in Boston, was at times intense. Zealous agitators fanned the embers of resentment, which ultimately burst into flames of military action.

Physicians were active in the strategy that led to rebellion and the declaration of independence from England. Drs. Joseph Warren and Benjamin Church were leaders in Boston's Committee of Safety, and they were among the 22 physician members of the Massachusetts Provincial Congress. Five or six physicians were among the "reluctant rebels" who signed the *Declaration of Independence* in the Continental Congress.[12] Numerous physicians held positions of prominence and influence elsewhere in the colonies during the formative years of the Revolution.

At the time of the centennial celebration in 1876, J. M. Toner, a Washington, D.

C., physician drew laboriously from revolutionary records the names of nearly 1200 medical men who aided in achieving independence. He thought that probably 100 of them were physicians with degrees. Not a few of the older men had served as regimental surgeons or assistants in the war of 1854–1863. The Continental Army, which assembled itself around Boston in 1775, was composed of men from local militia from various colonies. Surgeons and assistants were often selected on the basis of personal friendship or political influence. Unfortunately, some physicians found themselves in positions of trust beyond their capacity or experience. Such circumstances contributed to the general confusion and friction that characterized the medical service during the first years of the struggle. In a gesture of patriotic tolerance, Toner looked back on the unfortunate medical episodes of 1775–1781 with these words:

> . . . I may add that the supply of competent officers throughout the war proved ample to the demand. The careful student of this part of our history will discover that any difficulty which existed with the medical directors and surgeons, was not so much their want of education or professional attainments, as the novelty of their situation.[12]

The revolutionary leaders in New England had reason to be concerned over the military organization that assembled around Boston after the Minute Man escapade at Lexington and Concord in April, 1775. During the summer, the Continental Congress in Philadelphia was persuaded to accept responsibility for a Continental Army. George Washington was dispatched to the New England scene as commander-in-chief, and Benjamin Church, M.D., of Boston, at a salary of four dollars per day, was made the first director of what Congress chose to designate a "Hospital Department."

Dr. Church turned several small military hospitals in the area of Cambridge and Roxbury into what was called the "General Hospital" and ordered the abandonment of improvised regimental hospitals, with the intent that patients needing hospitalization be sent to the General Hospital, where there were competent surgeons with hospital experience. Regimental surgeons felt insulted by the order, even though some of them had never before seen a hospital. Some disgruntled field surgeons, having support from regimental officers who also felt depreciated, began to complain and find fault with the director and his close associates. It was true that supplies and medications were still very scarce. Necessities for the care of ambulatory sick and injured in camp were not always available.

Harsh and exaggerated criticisms soon went through channels to General Washington, who supported Dr. Church's organizational theory but ordered an official inquiry into the functions of the Hospital Department in each regiment. Before these investigations were ended, Dr. Church was discovered in treasonous correspondence with the British commander in Boston, General Thomas Gage. Dr. Church was imprisoned and later banished from the country. He took passage for the West Indies but his ship disappeared at sea and he was never heard of again.

When John Morgan succeeded to the directorship in October, 1775, he inherited a full-blown, well nigh insoluble problem. Meager supplies, petty politics, and professional jealousy nagged Dr. Morgan constantly. Furthermore, when Congress set

up the Hospital Department with provision for four surgeons and 20 mates for the General Hospital, no provision was made for supplies for the regimental surgeons and their mates. At Dr. Morgan's suggestion the regimental surgeons petitioned Congress. Dr. Morgan also sent recommendations and numerous requests. Congress finally acted favorably on a supply of medicines and instruments, but set up an elaborate system of paper reports for the surgeons and further irritated the field men by supporting the organizational plan of having no regimental hospitals except when specifically ordered.

The bitterly resentful field surgeons vigorously sought to undermine Director Morgan. In this they were ably assisted by Dr. Morgan's enemy, Dr. William Shippen, who had been named director of the "Flying Camp" medical service operating west of the Hudson River.

Meanwhile Congress purchased a large stock of medical supplies, some of which was being channeled southward. Dr. Morgan modified his stand and permitted the supplying of some regimental hospitals under specific circumstances, which in fact were seldom observed. When bed frames were constructed for General Hospital use, regimental surgeons filched them, some 2000 in all. In their spare moments they penned protests to their Congressmen.

Circulating from Boston to Baltimore during the summer and fall of 1776, Dr. Morgan worked hard to staff and supply various divisions of the general hospital. Meanwhile, Dr. Shippen spent considerable time in Philadelphia ingratiating himself with Congress. As a result, Congress entered into the folly of dividing the medical service into two geographical areas, Dr. Morgan to be responsible east of the Hudson and Dr. Shippen to the west. The decision had been further influenced by Dr. Samuel Stringer, who regarded himself as an autonomous medical director of the Northern Army then in upstate New York, even though Dr. Morgan had struggled to share with him his meager supplies. In reorganizing the medical service, there could not possibly be any unified command. Perhaps it was a planned first step in eliminating Dr. Morgan. On Jan. 9, 1777, without consulting Washington, Congress passed a resolution, dismissing both Drs. Morgan and Stringer and naming Dr. Shippen director general. Later, a committee concluded that there were no charges against Dr. Morgan's character or ability. Dr. Morgan then published his belabored 158 page document, *A Vindication of His Public Character. . . .* Congress was more to blame for the regrettable situation in the medical service than was Dr. Morgan, who never recovered from the bitterness of his experience. Twelve years before he had belittled Dr. Shippen. Now, Dr. Shippen triumphed over his professional enemy, who was sacrificed to "general complaint."

After much quibbling by Congress, Dr. Shippen succeeded in securing a reorganization of the Medical Department. Dr. Shippen, as director general, presided over three geographical subdivisions, each of which was headed by a deputy director general: the Eastern Department, headed by Dr. Isaac Foster; the Middle Department, vacant for a time, but later given to Dr. Benjamin Rush; and the Northern Department, under Dr. Jonathan Potts. Strangely enough (possibly for practical geographical reasons), a Southern Department was included in the resolution but not intended to come under the authority of the director general. Dr. William Rick-

man was director of the Southern Department until 1780. Dr. Shippen's plan included a "flying hospital," which actually was a sort of regimental hospital serving several military units.

All was not easy for Director General Shippen. Morale in the numerous divisions of the General Hospital and at Valley Forge during the winter of 1777–1778 sunk to a new low. Not a few army medical men did not approve of Congress' treatment of John Morgan; hence they were skeptical and critical. Before long there were whisperings about Dr. Shippen's misuse of funds and supplies, inefficient service, and unfair practices. Unlike Dr. Morgan, who circulated among the hospitals, Dr. Shippen was inclined to spend more time comfortably housed at his headquarters. Dr. Benjamin Rush, who sympathized with Dr. Morgan, led the opposition. Dr. Rush's innuendos soon became damaging charges and supported the allegations that Dr. Morgan lodged with Congress. They were encouraged by an impressive number of competent and influential members of the Medical Department, such as John Warren, Philip Turner, Isaac Foster, and James Tilton. Dr. Morgan, completely exonerated by a resolution of Congress, continued to heckle Congress to take action against his successor. A court martial was finally ordered at Morristown, New Jersey, in the spring of 1780. Dr. Shippen was ultimately acquitted because the charges were not clearly proved. Congress, apparently feeling that there was some measure of guilt, refused to confirm the acquittal but discharged him from arrest in August When the Hospital Department was again reorganized in the fall, Dr Shippen was re-elected director, but he resigned on Jan. 3, 1781. Thus ended the most violent period of the long-standing Morgan-Shippen feud. The principals were both men of competence and public spirit but both seemed unable to accept severe criticism. Unfortunately, there was without doubt some injustice in the treatment accorded both men. The spirit of revenge manifested by these physician patriots is not commendable. It is difficult for the historian to absolve Dr. Shippen entirely of the charges brought against him, but it should be noted that he enjoyed a long and honorable life otherwise.[14]

In association with Dr. Shippen, Dr. John Cochran is credited with the principal authorship of the Congressional resolutions that led to reorganization of the Hospital Department. When Dr. Shippen resigned in January, Dr. Cochran, on the recommendation of General Washington, was elected director. Dr. James Craik, also recommended by Washington, was appointed to the new post of chief physician and surgeon. Instead of deputy directors in the Middle, Eastern, and Northern departments, three chief hospital physicians were appointed to administer major hospital installations wherever operating. The new medical act continued the Southern Department but made it responsible to the Hospital Department. Dr. David Oliphant of South Carolina was the deputy director.[15]

Dr. Cochran had the good fortune to begin his service under happy auspices. He served throughout the remainder of the war without being discharged or forced to resign, as were his unhappy predecessors. He continued, nevertheless, to be plagued by acute shortages and the evils of an inflated currency.

It is unique that medical men in the Continental Army had neither military rank nor authority. Begrudged the status of officers and without the incentives stimulat-

ing to commissioned officers, these patriotic physicians, with few exceptions, toiled unsung and unheralded at the rear or in infested hospitals as long as their services were needed.

Duncan, after a careful study of the military medical scene from 1775 to 1783, estimates an annual death rate in the Continental Army of 20 per cent. On the assumption that approximately 50,000 men were in service a shorter or longer period of time each year, the loss of manpower was 10,000 per year. Malnutrition, lack of medicines and supplies, and unhygienic camp and hospital conditions justify the further conclusion that battle deaths amounted to only 10 per cent of the total, leaving disease—principally typhus, dysentery, smallpox, and other contagious disorders—responsible for nine tenths of all deaths. The record of a hard-hit coastal town, Marblehead, is significant. More than 20 per cent of the town population entered the service. When the war ended, the town had 1000 widows and 500 of their men were still in English prisons. The number of voters in the town had been reduced from 1200 to 500.[16]

For the most part, the British and other foreign troops engaged in the Revolutionary War fared better than the colonials. The foreign troops were largely professional soldiers, principally from European centers of population. They were the veterans of many engagements and the survivors of not a few epidemics—the possessors of a precious immunity in many instances. Furthermore, these foreign military organizations had more seasoned medical staffs and more adequate stores of equipment and medicines. Colonial troops, unused to travel, inordinate exposure, lack of food, and foul prison life, were easy victims of the then unconquered epidemic diseases. Too often the Americans were hospitalized in improvised country quarters, while the British utilized well-constructed buildings in the cities.

It has been believed by some that American medicine benefitted materially through its Revolutionary War experience. I find it difficult to justify such a conclusion. Brook Hindle, a recent, thorough investigator of the revolutionary period has clearly shown that scientific enterprises generally suffered during the years of the conflict. He agrees that although the stature and status of the profession were in some respects enhanced by reason of its wartime activities, scientific medicine was not notably advanced during these years.[17] Physicians were brought together from various communities on a scale not previously experienced. Furthermore, they treated traumatic injuries in large numbers and had abundant opportunity to make some progress in epidemiology and hygiene. Although some sound principles were enunciated, the record of the profession is not distinguished by originality or far-sighted progress.

It has already been noted that John Jones' *Plain, Concise, Practical Remarks* . . . lacked originality, although the book did reflect his experience in the Seven Years' War. American compendiums of Baron Van Swieten's *Diseases Incident to Armies* (1776, 1777) were indeed useful but had the American touch in the introduction only. Benjamin Rush's *Directions for Preserving the Health of Soldiers* (1778) was original and brief, the latter quality in particular being unique for Rush. In the same year Dr. William Brown, physician general of the Middle Department, published his *Pharmacopoeia*, America's first, but largely a compilation from an Edinburgh source. John

Morgan's *Recommendation of Inoculation* . . . (1776) was admittedly according to Baron Dimsdale's method. Rush's *New Method of Inoculation* . . . (1781) dealt principally with technique and originated as a medical school lecture.

The chief physician of the French expeditionary forces, Jean-François Coste, served America by publishing a brief pharmacopeia for use in the French hospitals and a pamphlet on asphyxia for the Philadelphia Humane Society. In accepting an honorary degree from the College of William and Mary, he declared (1782) that since the United States was now independent, medicine must also be free from subjection to authority, even that of the most celebrated masters.[18]

A few other colonial physicians reported cases or published minor observations based on their military service. Some of Benjamin Rush's later published observations were based in part at least on his wartime experience. James Tilton's subsequent publication on the subject of military hospitals certainly had its roots in his revolutionary medical experience.

THE YOUNG REPUBLIC

Zealous patriots, even before the Declaration of Independence, were predicting a wondrous destiny for the continent. After entering military medical service in 1775, Dr. John Warren, in an address before troops, pictured an America of one and a half billion people in 2000 A.D., with proportionable improvements in agriculture, the military, and polite arts and sciences. Dr. David Ramsay, of Charleston, South Carolina, was also a prophet of glory. On the second anniversary of independence he predicted that educational institutions in America would light up a blaze of knowledge that would finally illuminate "with rays of science the most distant retreats of ignorance and barbarity." That medical men were prominent among the orators and penmen who glorified the future of the young republic is one evidence of the broad role played by leaders in the profession and the high esteem in which they were held. With the successful close of the war, there was a rising crescendo of prophetic utterances designed to hide the true intellectual poverty of the newborn republic when compared with that of Europe.[19]

Some medical men and other persons competent to assess candidly the cultural state of the nation sensed its striking deficiencies and set about to organize philosophical, scientific, and professional societies. The New Jersey State Medical Society received a new lease on life after the war, and six other long-lived medical societies were formed within a decade after Yorktown. Only two of them published any proceedings before the turn of the century (Massachusetts Medical Society in 1790 and College of Physicians of Philadelphia in 1793).

Two additional medical schools, one at Harvard College in Cambridge (1782) and one at Dartmouth College in Hanover, New Hampshire (1798), were founded during this period. This gave the country four active medical schools at the close of the century. The other schools, in Philadelphia and New York, suffered some vagaries in tenure and academic identity but ultimately survived their probationary years. American medical schools were still intended to offer essentially an organized supplement to the traditional apprenticeship, which was the only educational experi-

ence of the great majority of American physicians at this time. Young men were continuing to go abroad for a medical education, but by the close of the century some interest was being shown in the example of London and Paris where hospital experience was emphasized. After the war, the eight year hiatus in relations with scientists and medical men in England began to close rapidly. Benjamin Rush graciously observed: "What has physic to do with taxation or independence?"[20] British journals opened their columns to American writers, and American publishers began to turn out American editions of English authors in an effort to make up for lost time. Some French and Continental medical literature reached America during the war, but it in no sense took the place of the previous flow of literature from the mother country.

Franz Anton Mesmer, discoverer of animal magnetism, was rejected by the medical profession in Europe and failed to win the support of either Franklin or Jefferson for his theories, but he was popular in France and gained the hearty support of Lafayette. The latter secured permission from Mesmer to reveal some of the secrets of hypnotism to George Washington when he, Lafayette, returned to America. His presentation to the American Philosophical Society in Philadelphia was not convincing, but the American public, including some physicians, was sufficiently gullible to guarantee a fortune to Elisha Perkins, who with his metallic tractors followed in the broad wake of Mesmer's animal magnetism. The day of the itinerant lecturer had arrived, and the future was promising for the quack and traveling healer in young America.

The first noteworthy contributions to American medical literature after the War were published in 1785, in the *Memoirs* of the American Academy of Arts and Sciences, a Boston society, and in the *Transactions* of the American Philosophical Society in Philadelphia, in 1786. These were followed in 1788 by an 86 page publication entitled *Cases and Observations by the Medical Society of New Haven County. . . .*, which contained 26 articles, including several clinical cases and autopsy reports and a paper on the spread of dysentery among troops because of overcrowding and foul air.

Much of the succeeding medical literature of the century dealt with yellow fever and other pestilential diseases that periodically ravaged the population. The most common mode of therapy in yellow fever was purgation and phlebotomy, vigorously defended by Benjamin Rush, who was a popular medical authority in the country during the last decade or two of the century.

Rush was a man of strong convictions and deep emotions. He was noted for his stubborn resistance to the ideas of others if contrary to his own, which he believed to be based on accurate observation and accepted truth. Unfortunately, he was given to flights of fancy and metaphysical predilections, both of which at times crept into his scientific utterances and writings. As an observant medical scientist he was probably at his best in analyzing and criticizing a cancer remedy concocted and promulgated by one of his former pupils. As an apprentice of Rush and a military surgeon during the Revolution, Hugh Martin had, for his time, a good education and valuable experience. Then, as now, there were cancer doctors. Dr. Martin aspired to do something about neoplasms. His contribution appeared in pamphlet form in 1782—

A Narrative of a . . . Sovereign Specific for the Cure of Cancers.[21] Dr. Martin submitted a copy to the American Philosophical Society, the country's highest scientific tribunal, and sought from the state a monopoly on the use of his powder remedy. His selfish zeal even led him to solicit a testimonial from George Washington. Washington replied that cures ought not to be kept secret and that recommendations of cured persons would be "vastly more pertinent" than his.[22] Having fathered Martin professionally, Dr. Rush no doubt felt both interested and obligated. He secured some of the powder after Dr. Martin's death, which by chemical analysis proved to be composed mainly of arsenic, which was commonly used in the treatment of cancer. The powder, although it contained some insignificant vegetable ingredients, was not a vegetable compound of Indian origin, as claimed by its producer. Dr. Rush also examined Dr. Martin's clinical records and concluded that the remedy had worked in several cases of cancerous ulcers but not in malignancies involving the lymphatic system.[24]

Located as he was in America's first center of medical learning and in an atmosphere of newly won independence and unrestrained national pride, Benjamin Rush experienced extraordinary success. The best-known physician of the day, he was very busy but made time to aid the principal reform movements of the day—capital punishment, temperance, education. He came to be regarded as an authority in numerous fields of social interest. He carried on an extensive mail consultation with his former students and professional colleagues who were at a distance. Further, many lay people throughout the country sought his medical advice directly through correspondence.

Success and experience emboldened Dr. Rush to remark in 1789 that he found all schemes of physic faulty and that he was evolving "a more simple and consistent system of medicine than the world had yet seen."[25] It seems that Rush's self-confidence continued unabated, for seven years later he propounded to his students a system that reduced all diseases to one and comparably simplified therapy. "I have formerly said that there was but one fever in the world," said Rush. "Be not startled, Gentlemen, follow me and I will say that there is but one disease in the world. The proximate cause of disease is irregular convulsive or wrong action in the system affected. This, Gentlemen, is a concise view of my theory of diseases. . . . I call upon you, Gentlemen, at this early period either to approve or disapprove it now."[26]

Unfortunately, many physicians, both in America and in Europe, as well as most of Dr. Rush's students accepted the theory and went about their professional duties imposing the heroic treatments of purging and bleeding. Dr. Rush claimed that this therapy was to reduce "convulsive action" by a process of "depletion." Richard Shryock has wryly observed that Dr. Rush's treatment was "if good for anything, literally 'good for what ails you,' since by definition the same thing ailed everyone."[27]

Benjamin Rush was definitely a citizen of the eighteenth century. Garrison has noted that a certain scientific sterility marked eighteenth century science and medicine as compared with those of the previous century, which were given character by such penetrating observers as Newton, Harvey, Bacon, and Leeuwenhoek. The eighteenth century had a worshipful respect for the achievements of the previous

generations and began to splint scientific curiosity by erecting currently accepted concepts into scientific dogma. Thus, the propounding of theories and systems came to be an end in itself. Although mathematical physics, chemistry, and invention made progress during the eighteenth century in Europe, medicine, except for a few original contributors like Morgagni, Hales, the Hunters, Wolf, and Jenner, was dominated by theorists and system-makers.[28]

American medicine during the generation of the Revolution produced nothing distinctively original. Except for being a few years behind the trends in Europe, American medicine was essentially European, with Scottish, English, and French influences predominating. Benjamin Rush was America's candidate for the dubious honor of system-making. As such, he is a landmark in American medicine but not a distinguished contributor to the stream of medical progress.

Professional feuds and mortality rates to the contrary notwithstanding, physicians of revolutionary America industriously nurtured a race of ambitious defenders of liberty. This they did well, within the context of the times and their individual capacities. They also joined heartily in the work of empire-building, frequently exchanging the lancet for a sword or giving up medical practice for public life as legislator, governor, or member of the President's cabinet in the new republic. The role of medicine and the profession during these years is an unheralded epic in the history of the United States.

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APPENDIX A

SIGNIFICANT MEDICAL EVENTS DURING THE ERA OF THE AMERICAN REVOLUTION 1750–1800

1750. John Bard (1716–1799) and Peter Middleton (?–1781) present systematic dissection for purpose of instruction in New York.
1751. The Pennsylvania Hospital, the first general hospital in colonial America, opens in Philadelphia.
1752. Benjamin Franklin (1706–1790) designs first flexible catheter in America.
1755. William Hunter (1730–1777) presents first publicly advertised systematic lectures on anatomy with dissection in Newport, Rhode Island.
1757. Thomas Walker (1715–1794), of Virginia, trephines bone for suppurative osteomyelitis.
1759. John Bard (1716–1799) reports a case of extrauterine pregnancy.
1762. William Shippen, Jr. (1736–1800), starts his famous anatomical lectures in Philadelphia with demonstration on cadaver.

1765. John Morgan (1735–1789) and William Shippen, Jr. (1736–1800), found medical department at College of Philadelphia, forerunner of University of Pennsylvania; Shippen presents first lectures on obstetrics.
1766. Establishment of the New Jersey Medical Society, first state medical society in America.
Thomas Bond (1712–1784) presents first clinical or bedside lecture course in America.
1767. Organization of medical school at King's College in New York City, forerunner of Columbia University College of Physicians and Surgeons.
1773. First insane asylum in America opened at Williamsburg, Virginia.
1775. Colonial Army medical department is first established.
1782. Harvard Medical School is founded.
1784. Benjamin Franklin (1706–1790) invents bifocals.
1786. Benjamin Waterhouse (1754–1846) presents first lectures on natural history at Rhode Island College.
1787. The College of Physicians of Philadelphia is founded.
1788. Hezekiah Beardsley (1748–1790) of Connecticut first describes congenital hypertrophic pyloric stenosis.
1790. William Boynham (1749–1814) of Virginia reports cases of extrauterine gestation in 1790 and 1799. Also, he is discoverer of vascularity of the rete mucosum.
1794. Jesse Bennett said to have performed first cesarean section in America, also bilateral oophorectomy.
1798. Medical department of Dartmouth College founded.
1800. Benjamin Waterhouse (1754–1846) introduces vaccination in America.

APPENDIX B

NOTABLE AMERICAN MEDICAL LITERATURE OF THE PERIOD 1750–1775

1750. Adam Thompson, Philadelphia, "A Discourse on the preparation of the body for small-pox . . . ."
1751. John Kearsley, Philadelphia, "A letter to a friend; containing remarks on a discourse proposing a preparation of the body for the small-pox . . . ."
Benjamin Franklin, publisher, Philadelphia, a book compilation of various British and American physicians and botanists with the initial title *Medicina Britanica* . . . .
1752. Nathaniel Williams, Boston, "The method of practice in the small-pox. . . ."
1753. John Lining, Charleston, S. C., "History of the yellow fever."
1754. John Mitchell, Virginia, "Essay on the causes of the different colors of people of different climates."
Benjamin Franklin, Philadelphia, "Some account of the Pennsylvania hospital . . . ."
Lionel Chalmers, Charleston, S. C., "Opisthotonus and tetanus."
1756. Langhlin Macleane, Philadelphia, "An essay on the expediency of inoculation and the season most proper for it . . . ."
John Lining, Charleston, S. C., "American yellow fever "
1760. John Bard, New York, published in London, "A case of extra-uterine foetus" in *Medical Observations and Inquiries*.
Anon., Boston, "Small-pox, directions concerning inoculation."
1764. Alexander Garden, Charleston, S. C., "An Account of the medical properties of pink root."
1765. Cadwallader Colden, New York, "Treatise on wounds and fevers."
John Morgan, Philadelphia, "A Discourse upon the institution of medical schools in America. . . ."
Thomas Ruston, Philadelphia, "An essay on inoculation for the small-pox . . . ."
1768. Lionel Chalmers, Charleston, S. C., "An essay on fevers."
1769. John Mitchell, Virginia, "Principles of botany."
Peter Middleton, New York City, "An historical inquiry into the ancient and present state of medicine."
Samuel Bard, New York City, "A discourse on the duties of a physician."
John Wesley, New York City, thirteenth edition, "Primitive physick, or an easy and natural method of curing most diseases."

Benjamin Rush, Philadelphia, "Observations on the angina maligna; or the putrid and ulcerous sore throat . . . by a lover of Pennsylvania."

John Ogden, New York, "Malignant sore throat distemper."

John Kearsley, Philadelphia, published in London, "Angina Maligna."

1771. Samuel Bard, New York City, "Enquiry into the nature, cause and cure of angina suffocativa or sore throat distemper."

1773. Benjamin Rush, Philadelphia, "Experiments and observations on the mineral waters of Philadelphia, Abington and Bristol, Pa. . . ."

Benjamin Rush, Philadelphia, "An oration . . . containing an enquiry into the natural history of medicine among the Indians in North America . . . ."

1775. John Hill, Philadelphia, "The old man's guide to health and longer life; with rules for diet, exercise, and physic."

John Jones, Philadelphia, "Plain, concise and practical remarks on the treatment of wounds and fractures."

APPENDIX C

MEDICAL PUBLICATIONS PRINTED IN THE UNITED STATES JAN. 1, 1776–DEC. 31, 1799*

American authored medical books:	
First editions	39
Later editions	9
Total volumes	51
Reprints and translations of foreign medical books:	
First editions	28
Later editions	11
Total volumes	49
American medical journals:	1
Volumes completed	2
Transactions of medical societies:	
Volumes completed	7

APPENDIX D

IMPORTANT MEDICAL SOCIETIES BEFORE 1800

New Jersey State Medical Society	1766
Massachusetts Medical Society	1781
College of Physicians of Philadelphia	1787
Medical Society of Delaware	1789
Medical and Chirurgical Faculty of Maryland	1789
Medical Society of South Carolina	1789
New Hampshire Medical Society	1791
Medical Society of New Haven County	1784

* As compiled by Billings, J. S.: Literature and Institutions. *In:* Clarke, E. H., et al.: A Century of American Medicine, Philadelphia, Henry C. Lea, 1876, p. 294.

The Lessons of the War between the States

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Americans have in recent years been showing an awakened interest in the great war of the 1860's, one of the greatest of modern conflicts. Battles raged over an area from Pennsylvania to Florida, from Washington City to the plains of Texas; more than three million men took part in the war. In the intensity of the conflict, the wide distribution of its operations, and its terrible toll of men and property, the American Civil War rivaled even the Napoleonic Wars.

Consequently, hundreds of cities and villages were damaged or destroyed, and vast areas of the best agricultural land of North and South were ravaged. Peaceful regions that had never before known the havoc of war became positions of importance, and backwoods hamlets became clogged with hordes of wounded men. It was the first experience of the American people with what has come to be called "total war," one that could end only with the total defeat and ruin of one side or the other.

The impact of the war was immensely greater because it involved not one, but two governments and hence two war organizations. Logically, this fact led to another: it necessitated the building of two very large military medical departments to care for the massive armies that were enlisted. Thus the medical experience of Americans was much more intensive than would have been the case in a war between the United States and a foreign power, for both great sections of the United States, North and South, had to learn to build and administer large military medical organizations.

Medicine in wartime has a far greater importance than its primary function, that of maintaining a healthy fighting force, would seem to indicate. Since the rate of injury and of illness is greater in wartime than in periods of peace, the medical activity is accelerated to a vast degree. Illnesses of all kinds come frequently to large bodies of men crowded together in cantonments and subjected continually and for long periods of time to demands on their physical endurance to which they have never been accustomed. In addition to the hazard of battle wounds are those of exposure to severe climatic conditions and of campaigning in swampy or other unhealthful areas. For the medical men of both the Union and the Confederate medical departments, the dreadful havoc of the War furnished pathological and surgical data of immense importance. The postwar generation of physicians and patients and the field of medicine in general were benefited by possessing so large a segment of the medical records of the four year conflict.

The combat medical man is in many ways a unique person. He does not wage war, yet without his assistance, war could not be waged. He does not kill intentionally, for his mission is to save, not destroy, life. His personal risk, however, is nearly as great as that of the fighting soldier; he fights infections that most of the army are never subjected to, but that may be fatal to him. He wages a never-ending battle with death, even while most of the troops are safe in rest camps. While his service is not as dramatic as theirs, he deserves much of the credit that a fighting

detachment may receive, for it is largely due to him that it can continue to exist and function as a military organization. In the stress of battle, he may, and often does, receive blame for conditions that are actually supply deficiencies or the result of bad army staff administration. To a considerable extent, he has been the "forgotten man" of our military history.

THE MEDICAL EXPERIENCE OF THE NORTH

During most of the 90 years and more since the end of the war, the record of the Union Army has been better known to the general public than that of its valiant but less successful opponent. The reasons for the obscurity of the Confederate experience are fairly clear. As an established organization, the "Old Army" was in a better position to keep its records and to tell its own story. Moreover, since victory came at length to the Northern troops, it became the habit of historians for a generation or more to relate the history of the war as a massive insurrection against United States authority, which was fortunately put down. Northern records became the only "official" ones; those of the Confederacy were long disregarded. Even though a more impartial attitude might have prevailed, the difficulties of securing source material would have been formidable, for valuable papers were lost or destroyed in the capture and looting of Southern cities that attended the "anaconda" choking of the Confederacy by Sherman and Grant in the last two years of war.

Yet the coming of the struggle caught the Unionist part of the nation almost completely unprepared. The regular United States Army numbered only about 16,000 men, widely scattered at small posts throughout the country. Since our previous military experience, including the invasion of Mexico in 1846–1847, had involved very small forces, those agencies that supplied and equipped the troops were small and antiquated. The North, as well as the South, expected a short war, and improvised raw volunteer organizations without adequate equipment or services. This unrealistic attitude remained long after logic should have proved it to be fallacious. The Congress of the United States began its enlargement of the Army Medical Department by authorizing the commissioning of 10 surgeons and 20 assistant surgeons; by the end of the conflict, 12,343 medical officers and contract surgeons had served in the Union Army.

The Surgeon General of the Army, Clement L. Finlay, commanded in 1861 a force of 114 officers and three clerks, plus a few hospital stewards. His single general hospital, at Fort Leavenworth, contained but 40 beds. All hospital wardmasters, cooks, and nurses had to be detailed to the Medical Corps from the line service; this practice gave the medical men an uncertain number of aides, usually devoid of any medical experience. While legislation soon provided for large increases in medical officers and for the addition of female nurses, the supply of medical personnel was never adequate, especially in the first two years of war.

A large share of the inadequacy and failure of the Medical Department during the first half of the war can be traced to administrative difficulties. The erection and equipment of military hospitals and the transportation of sick and wounded were functions of the Quartermaster Corps; the procurement of medical supplies was the duty of the Subsistence Department. Surgeon General Finlay, who had served in the

Army since 1818, had to be removed in 1862, having proved himself utterly incapable of mobilizing a medical force of the type needed. His successor, Dr. William A. Hammond, was elevated to his position over the heads of many seniors and, when appointed, held the rank of assistant surgeon in the Regular Army. Hammond was a brilliant man, having had 11 years service in the Army before retiring in 1860 to take a professorship at the University of Maryland. Backed by the influential Sanitary Commission and by General McClellan, but opposed strenuously by Secretary Stanton and by the many officers who resented this invasion of their seniority, General Hammond entered upon a sea of troubles, which not even his brilliant and conscientious service could ever overcome. Through a series of shabby maneuvers, Hammond was first temporarily replaced and later court-martialed and removed from office, to be succeeded by Col. Joseph K. Barnes, a favorite of Stanton, who was eventually to reap the reward of many of the reforms proposed or initiated by Hammond. Not until 1878 did Congress and President Hayes erase the stigma of Hammond's removal by a measure of reinstatement.

The bitter conflict between the Surgeon General and the Secretary of War, with the subordinate arguments that continued during much of the war, were all part of a much greater problem: what type of medical organization was best in such an emergency? Secretary Stanton looked on the situation as one that needed strong centralization of power, in the hands, it might be added, of himself, a lover of power. Medical matters were clearly subordinate, in his view, to the grand strategy of the war. Holding this view, Stanton was disinclined to allow staff officers of the department, even heads of services, to develop unified control of functions, lest such decentralization weaken the prestige of his own office. Confronted by a medical commander who was determined to build a department commensurate with the demands of the conflict, Stanton at first obstructed his projects, and later, coming to fear and hate his subordinate, craftily plotted his downfall.

Hammond's project for a regular ambulance corps for the army was vetoed by Stanton; another plan, to develop a graduate school of military medicine, suffered the same fate. Many of Hammond's other proposals—including one to raise the rank of medical officers who carried on important administrative activity; another to add more medical inspectors to the army; still another to improve the quality and amount of hospital rations—were either killed by Congress or suffered mutilation by one house or the other. As mentioned earlier, it is a sad commentary on the battle between Stanton and Hammond that under Barnes, a man less capable than his predecessor, a large amount of the Hammond program was accomplished. The Army Medical School and Museum were eventually established; the monumental medical and surgical history of the war was started; an ambulance organization, begun under General McClellan's authority for the Army of the Potomac, became general throughout the Union forces by the later months of the war; medical expenditures were liberalized; and many administrative reforms that had seemed impossible under Hammond seemed to be relatively easy under General Barnes.

The problem of securing proper medical personnel for the army was always present. To a large extent, the difficulty hinged on old and irrelevant legislation still in force, both in the Federal Government and in the states. Since most Regular Army sur-

geons and assistant surgeons in service when the war began were used during the war for staff duty, the great burden of caring for the soldiers fell on the regimental medical officers and contract officers, the former to take care of the troops in the field and the latter group to serve in the general hospitals. The regimental medical staff had been fixed by Congress at one surgeon and two assistants; the various states had to secure the proper number of volunteer medical men for each of their regiments and replacements for them when and if they should resign. The Federal authorities, meanwhile, endeavored to sign up enough contract surgeons to provide one for each 100 men in the hospitals.

All sorts of difficulties appeared as efforts were made to fulfill this program. As the war progressed, medical men became more and more unwilling to accept medical commissions or contracts, for the absence of so many wartime medical men from their localities made civilian practice more lucrative. The various states, confronted with the need to secure medical men quickly to fill the medical quotas of new regiments, hesitated between strict examinations to ensure quality, and no examinations at all, to get the job done. A theory existed in New York State that lenient examinations were best, as many rural physicians of "sterling worth" and large practical experience would otherwise be lost to the service. Indeed it appeared, from the results of General Hammond's strict examination system, carried out by the Army Medical Board in the fall of 1862, that the army was not securing enough medical personnel. The grueling oral questioning, lasting up to two hours, on general subjects such as history, geography, zoology, literature, natural philosophy, and languages, followed by a three hour written test on 11 different medical and related subjects, eliminated so many that Secretary Stanton was moved to order that if more men were not passed, the board would be broken up. The resulting leniency of the board in letting men through seemed to have no bad effect on the quality of the candidates.

How good the Civil War medics were is rather difficult to say. Judged by modern standards, few would be considered competent or well trained. Nearly all had medical diplomas, but this did not make them better, necessarily, than the earlier generation of office-trained men. There were many American medical schools in the mid-nineteenth century, but most of them had extremely low standards. They usually required but two school years of nine months each, plus a term of service with a medical practitioner. The same lectures were usually given the second year as were given the first. The schools were poorly equipped, and there was little or no attention given laboratory practice or clinical instruction. Even the Harvard Medical School had no microscopes or stethoscopes until after the war. Bacteriology and antisepsis were not known. Even instruments already known, such as the clinical thermometer, the hypodermic syringe, the ophthalmoscope, and the laryngoscope, were seldom used in the Union Army.

Yet the army obtained the services of many hundreds of medical men who learned by observation, study, and hard experience many of the lessons that their inadequate training had deprived them of. Brilliant young men such as W. W. Keen, John Shaw Billings, and S. Weir Mitchell were Union Army surgeons. Dr. Keen was later to attain international reputation as a neurologist; Dr. Billings was the organizer and head for 30 years of the great Army Medical Library and began the publica-

tion of the monthly *Index Medicus;* Dr. Mitchell became one of the greatest of American neurologists. Many Army physicians contributed valuable chapters to the *Medical and Surgical History of the War of the Rebellion*, published after the war under the authority of the Surgeon General, of which more will be said later.

It was inevitable that Regular Army medical men and the medical volunteers should resent one another. The medics of the old army had fixed ideas about routine duties; their patronizing attitude toward civilian physicians was accentuated by the fact that they occupied most of the administrative offices and often bore down hard on volunteers whom they considered inattentive to routine and slow in forwarding proper reports. The Sanitary Commission, in summarizing the findings of its medical inspectors at the end of 1861, found 2 per cent of the medical men of 200 regiments incompetent and some 13 per cent of doubtful competence. Sixty-four per cent, however, it judged, were performing their duties "with creditable energy and earnestness." There was a feeling that the volunteer surgeons were most lacking in their surgical ability and their neglect of sanitation and hygiene.

After the major battles of the war, a mass of criticism arose reflecting on the competence, honesty, and humanity of the medical officers. Many were charged with drunkenness; others were accused of appropriating delicacies sent the hospitals by the Sanitary Commission; others were said to give the wounded rough treatment in probing or dressing their wounds. Women nurses complained of the "drunken carousals" of the medical men, and one such complaint reached Congress. On the other hand, Dr. Elisha Harris of the Sanitary Commission stated that in his opinion the medical officers were the most temperate of any of the commissioned men of the army, and that their occasional lapses resulted from exhaustion after days and nights of continuous work. This general opinion was shared by John Shaw Billings and by the famous poet-nurse Walt Whitman, both of whom held high opinions of the physicians, though Billings did admit that the surgeons were considered quacks by many of the men.

Probably the most unsuccessful of the medical personnel groups utilized by the army was that of the civilian volunteers, who appeared in great numbers after major engagements to help in operative work. These may have had mixed motives in appearing at such times. Patriotism undoubtedly actuated many; some undoubtedly wished to secure quick surgical experience; perhaps others had a taste for the adventure of the thing. The practice of using civilian physicians seems to have begun with the arrival of a number of surgeons from Massachusetts at the request of General Burnside and Medical Director Hamilton at the North Carolina base of Burnside's invading force, in February, 1862. Later in the year, more civilian physicians were sent to help the men of McClellan's army on the York Peninsula, the request coming from the Secretary of War. Difficulties arose instantly over these civilian physicians. They were not under army discipline, could come and go as they wished, and often refused to perform the more arduous, but necessary, work of caring for the sick. It is said that at Bull Run, many of them refused hospital assignments, standing on their right to operate on the battlefield. After Gettysburg had demonstrated the flaws in the "civilian-auxiliary" practice, General Hammond took action. With the cooperation of the governors of the states, reserve surgeons corps

were formed whose members had to be vouched for by the state authorities and would be sent for by telegram when needed. Under the new system, the civilians were paid the salary of contract surgeons, were to be subject to the orders of the Medical Department, and, unless released officially, had to remain at a given post at least 15 days. In some of the last campaigns of the war, especially during Grant's campaign in the wilderness and thereafter, the reserve surgeons were present in large numbers and rendered valuable service.

By and large, the medical men of the Union Army were a conscientious and courageous group. In the bloody campaigns from Bull Run to Petersburg, all surgeons, whether regular, volunteer, or civilian reserve, usually bore the heat and danger of battle and endured the heavy casualties that such service entailed. It is claimed that the Medical Corps, with 43 officers killed in action, 83 wounded, and 290 dead of disease or accident, suffered higher casualties than any staff corps of the army.

The real worth of a military medical organization, like that of its parent, the entire army, can be adequately tested only in combat. During 1861 and much of 1862, the essentials of an effective medical field service were almost completely lacking. Until the second half of the latter year, there was no ambulance service and no comprehensive hospital system. The regiments that arrived from the North in 1861 brought along volunteer surgeons who knew nothing of the army or of army reports. After Bull Run (July 18, 1861), the sick and wounded were mostly scattered in various Washington hospitals. The Medical Director of the newly formed Army of the Potomac, Dr. Charles S. Tripler, first became aware of the existence of units of the army in Cumberland, Maryland, through a report of bad conditions in the army hospital at that place. Tripler had no medical inspectors to forward reports from hospitals; there were no provisions for the training of hospital or ambulance personnel. Faced with the huge task of developing a workable field service in the heavy campaigning that was to come, Tripler decided to make the brigade surgeons the chief subordinate administrators of the new army. Most of these men, he judged, were more capable than the average regimental surgeon, since they had seen service at Bull Run and knew something of what was required of them.

In the proposed brigade medical plan, sanitary reports were to be collected after inspection of the various regimental camps; in addition, the brigade surgeon was expected to maintain the medical supplies for the command and to transmit weekly sick reports from each regiment and casualty reports after each action. Ten men from each regiment were to be trained as stretcher-bearers under the brigade surgeon's direction; he was also charged with organizing a field hospital and a surgical staff for it at the time of an engagement. By the next spring, when the Army of the Potomac took the field, regular hospital inspectors were appointed in Tripler's command, and each division staff included a medical director. This was the skeleton of administration by the spring of 1862, and it remained essentially the same for the rest of the war. The Surgeon General exercised control through his directives to the medical directors of each army or military department, and was kept informed by their reports to him, checked by the reports of medical inspectors appointed under the Act of Congress of April 16, 1862.

This was merely a framework; its operation was an improvement over the chaos of

1861, but it was still far from perfect. The Regular Army physicians, who held most of the higher positions, were conservative and often without administrative ability. The volunteers in the regimental posts were often ignorant and uncooperative. A medical director had authority to organize his command in preparation for battle, but he was in command of only his medical officers, hospital stewards, and nurses; the ambulances and their crews belonged to the Quartermaster Corps. Conflict could, and often did, occur between officers of the two services. The most serious breakdown of medical services happened when the commanding general himself denied his medical director full authority or failed to give him reasonable cooperation. McClellan supported Director Tripler solidly and stood strongly behind Tripler's successor, Dr. Jonathan Letterman. Dr. John H. Brinton was fortunate also in having General Grant as a superior. But in some commands no such pleasant relationship existed. Under General Buell, commander of the Army of the Ohio, the medical personnel were badly treated; it was almost impossible to secure the detail of men for hospital service. Said Buell: "The Medical Department should be self-sustaining—the sick should care for the sick." In the medical department of the South, late in the war, the medical director not only failed to get his hospital details, but also had his ambulance horses requisitioned away as remounts for the cavalry.

A basic item, in getting the command ready for battle, was to secure an adequate number of ambulances. This was always a battle in itself. Director Tripler felt that an army of 100,000 men, which the Army of the Potomac approached, should have an ambulance train of 250 vehicles. Although this was less than half the army allotment of one four-wheeler and five two-wheelers per regiment, it was found that the Quartermaster Corps could not deliver the number asked. Of 228 ambulances delivered to the army between July 1 and early fall, 1862, more than half were out of service by October 1, through breakdowns or by illegal use of ambulances for other purposes by the army. General McClellan's strong action stopped the raiding of the medical director's ambulance train, and the weak and uncomfortable two-wheeler was virtually abandoned.

Within the regiment, the traditional basis of military and medical activity in the field, the medical officers either worked frantically in periods of heavy fighting or had little but routine duties to perform. Whenever the day's demands allowed, "sick call" brought in those men who for some reason wished to be excused from regular duty. The assistant surgeon usually examined these men, and either placed them in the small regimental hospital or assigned them to some lighter duty, if necessary. He could, of course, send them back to their regular activity if their ills were imaginary or inconsequential. Meanwhile, the surgeon of the regiment would occupy himself with the seriously ill or wounded.

As an engagement seemed imminent, the regimental medical staff selected a site in the rear, for a field hospital, out of range, they hoped, of enemy artillery. The detail of 10 men, plus regimental musicians, who "doubled" as hospital attendants, was divided into a stretcher detail and a nurse detail. The steward would lay out supplies of opiates, medicines, instruments, and whiskey; the cooks would prepare hot water for coffee or soup and prepare sponges. The assistant surgeon meanwhile prepared to go forward, laden with his first-aid knapsack, to establish a forward or

first-aid station. To him would go the first patients, to receive a dose of whiskey and initial bandaging, after which they would be placed in an ambulance to be taken to the regimental field hospital. The stretcher-bearers, under supervision of the assistant surgeon, were supposed to cover the field and carry or lead the wounded men to the forward station. Back at the field hospital, the wounded might be operated on at once, if necessary; most of them, in any case, were usually evacuated within a few days to a general hospital at the army's base or to a more distant point.

Many things might happen contrary to such an orderly and carefully mapped-out plan. The musicians were likely to disappear and duck their disagreeable avocation, while the regular detail might or might not be equal to its task of gathering the wounded or of acting as nurses in the field hospital. At times, runaway slaves who attached themselves to the army would be used as nurses; paroled Confederate prisoners performed such duty in the Gettysburg campaign. Occasionally parents or friends of the wounded would be allowed to help. Medical stores were frequently lost or delayed by some breakdown in the supply system from the army headquarters to the regiment. The regimental surgeon and his assistant were frequently incapable of carrying on even their small administrative tasks while ministering to the wounded at the forward station or back of the battle lines.

Even the basic regimental medical plans could go awry under battle conditions that might end in a single day or in a few hours, but the confusion and suffering of the men were greatly multiplied when the regiment was attached to a large army, most of which might be engaged in an all-day struggle or in a campaign that might continue for a week or more. Bull Run, with its amateurish operations and complete incompetence, was bad enough. The Peninsular Campaign, with its larger operations and its greater logistical problems, demonstrated the complete failure of the army to care properly for the enormous numbers of sick and wounded who swamped the Medical Director as thousands of casualties poured back from the battle action of the Seven Days after June 26, 1862.

McClellan's drive against Richmond should not have presented any such medical problems as confronted Director Tripler's department. The Union Army controlled both land and water communications to the fighting front; shipping and railroad facilities were at hand to evacuate the wounded. Yet bad teamwork and inadequate planning made the medical effort a complete failure. The supply of ambulances was insufficient; the regimental hospitals operated as separate units, instead of joining in more effective brigade units; wounded men who found their way into the hospital of a regiment other than their own complicated the food problem, since food issues were on a regimental basis; quartermasters and commissaries failed to supply food, utensils, tents, and other necessities; many of the regiments left their wounded in farmhouses, where the Confederates often captured them.

The director, Dr. Tripler, received the blame for much of this, and in one respect, at least, the fault was his. He decided to leave the sick with the army instead of evacuating them, probably under a mistaken notion that their recovery would aid the strength of the army. But the illnesses of the men, which included many cases of malaria, dysentery, and typhoid, called for their evacuation to base hospitals in the rear, which had not been set up. When the intensive fighting of June began, the

field hospitals were overcrowded and in no condition to receive the thousands of wounded. At this juncture, the army changed its base from White House in front of Richmond to Harrison's Landing on the James River; from the latter point, an attempt was made to evacuate the seriously wounded by ship. Here the Quartermaster Department, in charge of the hospital ships, fell down badly, and the evacuation was eventually carried out by the Sanitary Commission, which hurried physicians, nurses, and supplies to the place, and helped to alleviate a terrible situation.

Both the Sanitary Commission and the Secretary of War became concerned about the medical administration of the army; a medical inspector was rushed to the Peninsula, followed shortly by a medical investigator directly from the secretary's office. On July 4, just before the evacuation of those wounded in the Seven Days battles was completed, Dr. Tripler was removed and Dr. Jonathan Letterman appointed to his post. Not all the tragedy can be fairly placed on the head of the former Medical Director, as Dr. Letterman was soon to learn. The lack of cooperation between the services responsible for transportation and supply had let the army down; the line and volunteer medical men had displayed a lack of teamwork that might have defeated an even more able director than Dr. Tripler. It is only fair to point out that neither Dr. Tripler nor the commanding general himself could have been completely aware of the extent or intensity of the engagements that were about to take place. General Lee's vigorous offensive against the attacking forces caught General McClellan and his generals by surprise, and the resulting highly mobile maneuvers threatened a complete defeat of the Army of the Potomac. McClellan's campaign was a failure, and naturally enough, all staff organizations, including medical, were sharply criticized for their parts in the near disaster.

The same ineptitude and bad management of the sick and wounded were repeated with even more deplorable results during the sorry showing of General Pope in his new command at the Second Bull Run in late August, 1862. One would have supposed that Secretary Stanton would now give ear to General Hammond's pleas for a regular ambulance corps under his department and for the transfer of medical transport to medical control. But Stanton was not ready, as we have seen, to issue the necessary orders. Meanwhile Lee moved North swiftly and McClellan, to whose army the remnants of Pope's defeated command were added, hastened to head him off. Luckily, McClellan had the vision and imagination to establish at once a regular ambulance corps within the Army of the Potomac. With only a month to organize his new unit before the Antietam campaign of September 14 to 17, the clearing of the field by Dr. Letterman's ambulance men showed marked improvement over that of any previous engagement, despite the fact that Sharpsburg, the final battle of the campaign, has been called the "bloodiest day in American history." Even the short period of training of the new ambulance men showed its effect.

Luckily a new supply of ambulances was available and, aided by these, Letterman's partly trained organization cleared all the wounded from the battlefield by the day after the battle. Unfortunately, the new director was unable to enforce his new plan of divisional hospitals. Aided by supplies ordered before the battle from Washington, Alexandria, and Baltimore and by the fine supply activity of the Sanitary Commission, Dr. Letterman was able to remove some 10,000 Union and 4000

Confederate wounded from the field hospitals to Frederick, Maryland, where he set up a temporary general hospital, and thence by easy stages to the larger general hospitals in Washington, Baltimore, and other points. It was at Frederick that it was found that surgical patients treated out-of-doors showed a lower mortality and a quicker recovery rate than others, a lesson heeded later by Union surgeons and medical administrators.

Dr. Letterman followed up the experience of Antietam, in preparation for the severe actions certain to follow, by a reorganization of the supply system on a divisional basis; he assigned officers as medical directors of corps, and others to act as medical inspectors under them, to secure better coordination of medical activities. Within the divisional hospitals he set up a division of labor among the medical personnel. By this method, officers were definitely assigned to operative surgery, keeping of records, management of supplies, or the dressing of wounds. These arrangements, together with his perfected ambulance corps, gave an excellent account of themselves in a very difficult test, the terrible Union defeat at Fredericksburg in December, 1862.

The armies of the West had experience with their medical activities similar to that of the East. Wherever some approximation to the improvements wrought by Dr. Letterman in the Army of the Potomac was achieved, the results were usually better. The Army of the Cumberland fought the great battle of Stone's River, Tennessee, on New Year's Day, 1863; although 12,000 wounded had to be cared for in that bloody engagement, the medical staff functioned well. Without any Regular Army–wide ambulance system, one corps, the 14th, had an ambulance and field hospital organization that matched Dr. Letterman's in the East. The bad management of the Medical Department in the West was greatly improved in late 1862 by the excellent work of Assistant Surgeon General Wood, who coordinated western medical affairs first at St. Louis, later at Louisville. On March 30, 1863, after the Surgeon General's official circular praising Dr. Letterman's ambulance system, a similar organization was set up for General Grant's Army of the Tennessee, and a little later, the divisional hospital system was set up. Grant's command thus obtained a smooth-working field and hospital system that added greatly to the effectiveness of his operations for the rest of the year. The western combat area presented certain difficulties; its field of operations was very large, making communication difficult; it suffered from a greater scarcity of supplies than the East; while the wounded were evacuated quickly when the fighting took place near the Mississippi, Tennessee, and Cumberland rivers, this advantage was lost when operations advanced into the mountains of southern Tennessee and into Georgia.

In the operations of 1864 and 1865, aided by the law of March 11, 1864, which made Dr. Letterman's ambulance system general throughout the entire army, conditions in general became greatly improved. Most, if not all, of the breakdowns in medical department efficiency were occasioned by the character of the fighting in Grant's and Sherman's commands. In the last two years of warfare, the chaos of Bull Run had changed by slow and painful stages into a systematic organization, with a trained Hospital Corps and well-established corps hospitals, functioning wherever Union Army operations took place. Back of the combat areas, especially

in Washington, Philadelphia, and the Louisville area, huge general hospitals were constructed in 1863 and later, in addition to those occupying existing structures altered for hospital purposes. The newer ones often followed the practice of separating the men into pavilion wards, usually 150 by 25 feet, with high ceilings and good ventilation. The hospitals were usually equipped with steam laundries, kitchens, dispensaries, ice rooms, and food storage cellars, with quarters for nurses and guards, rooms for storing records and, of course, operative facilities.

The surgery of the war period was carried on in a period of transition. Operations under general anesthesia were possible and had been carried on, in civilian practice, since the 1840's, but modern antiseptic techniques were still to come. The problem usually was how to deal with a wound made by a soft lead musket bullet, since the vast majority of the wounded, some 94 per cent, received their injury from these missiles. Even with such simplification of the surgical problem, it was found that thousands of wounds became infected. This was due partly to the nature of the projectile, which, being softer than modern steel-jacketed missiles and traveling with low velocity, often lodged in the tissues, carrying with it particles of skin and clothing. Wounds were received, in nearly three fourths of the cases, in the extremities, much less frequently in the torso, and least of all in the head, face, or neck. This distribution may have been due to the practice of fighting behind cover, as well as to the poor marksmanship possible with the old musket, a highly ineffective weapon except at very close range.

The surgery, while often considered good by the standards of the time, was very poor by the standards of today, and much of it was of a type resembling actual butchery. As noted previously, very few of the operating surgeons were well trained or experienced at the beginning of the war. Those with little or no previous practice had to perform what were, for the time and under the circumstances, serious operations. The more ambitious surgeons attempted surgical experiments that called for far better conditions than were available. One, for example, performed a resection of the head of the humerus; another attempted a disarticulation of the hip joint. Young assistants operated with great zeal, but little knowledge. Liquor was given the wounded to counteract shock, a practice now frowned upon. Frequently, nondisinfected lint was stuffed into a wound to keep it open, although many surgeons closed all wound cavities and kept them closed. The less seriously wounded and the mortally wounded were generally passed over by the operating teams, while those with apparent chance of recovery were operated on first.

The surgeons believed in operating, usually, before the irritative or infectious state began, unless the patient was in a state of shock, in which case a period of rest would be given. Yet when the wounded began to pour in, the latter precaution went by the board; under great pressure during a big battle, the wounded man would be dosed with liquor, and then his wound would be probed to locate the bullet, sometimes before he was given anesthesia. Many of these operations were horrifying procedures, with the surgeon standing beside the table, his sleeves rolled up, his arms and apron smeared with blood; sometimes his knife was held in his teeth while his hands were otherwise occupied. With the screaming patient in position, the surgeon would motion to his assistant to give the chloroform or ether, would wipe

the knife across his bloody apron, and operate quickly. The patient would be sent away, or what was left of him would be borne to the field tent by the stretcher-bearers, as the surgeon would straighten up, sigh, and then shout, "Next!" Much of this might take place in the open air, in order to have better light, and sometimes in full view of piles of arms and legs recently severed and cast hurriedly aside. During and after big battles, the surgeons often worked through the night and into the next day without rest. One surgeon wrote home that he had operated steadily for four days and two nights, that his feet were so badly swollen that he could hardly stand. But exhausted as he was, he had to continue, for there were a hundred amputation cases waiting for him.

General anesthesia was common, almost the rule, in the Union Army, although a few of the old-time surgeons argued against it. Chloroform was preferred because of its more speedy action, its smaller bulk, and its noninflammability. It was not understood then that ether was a dangerous drug in shock because of its tendency to distend the blood vessels and thus help cause or prolong hemorrhage. It may have been that the experience of the British in using chloroform in the Crimean War influenced American physicians in its favor. The mortality from anesthetics was very low, amounting to only 43 deaths in 80,000 administrations. Much fatal hemorrhage was due, probably, to the use of undisinfected sutures. Much valuable, although costly, experience was gained in trying a number of methods of stopping serious bleeding during operations. Although tourniquets were sometimes used for brief periods, as well as manual compression of arteries by the assistant, the ligature was the favorite method and was used in the majority of cases. Yet a mortality rate of more than 60 per cent resulted from ineffective efforts to end hemorrhages, compared to a general mortality rate of 13.6 per cent in all gunshot wound cases.

Infections were of course complicated by hemorrhage, which indeed often caused infection. The pus-producing *Staphylococcus* infection was regarded as a normal condition of tissue repair. The wound was supposed to suppurate in order to heal. Septicemia and pyemia, infections of the blood stream, were regarded as serious, but along with "hospital gangrene" were expected to occur frequently whenever there were large numbers of patients in a crowded area. Much of the infection so deadly to the Union Army was doubtless acquired at the time of the operation, from instruments that were not surgically clean; basins, sponges, and lint, used in the dressing of wounds, were not aseptic; old dressings, merely rinsed in water, were often used on new patients.

Surprisingly enough, many chemicals of antiseptic value were used by Union physicians. Carbolic acid, the virtues of which were first widely advertised by Lord Lister in 1867, was a popular antiseptic. Iodine, bromine, bichloride of mercury, and several acids, among them hydrochloric, sulfuric, nitric, and nitrous, also were employed in the hospitals. But the use of antiseptics was sporadic and ineffective, probably because of widespread ignorance of the nature and course of infection. The "cleanliness crusade" carried on by the Sanitary Commission and many of the better hospital officials was helpful in lessening the spread of infection. This movement was encouraged by the American Medical Association, in a special bulletin in 1864, in which it called "ventilation" the great lesson of the war. But the Medical

Association, in lauding the ventilative virtues, exaggerated the bacteria-carrying power of the air when it explained that the air was full of "pus-corpuscles floating about as dust," which could carry gangrene or erysipelas to every wound they might contact. To a certain extent, this theory directed attention away from the patient to his surroundings, which, while helpful, was not as vital as an attack on the infection progressing in the patient's body.

Illness of a prolonged nature in the Union Army was the result of three principal conditions: infections that resulted from inferior surgery, complicated by postoperative neglect; the rapid movements and changes of base, which constantly interrupted the flow of medical supplies and defeated the plans of the medical officers; and the serious neglect of sanitation or hygienic provisions among the men. In the armies of the North, 4 persons died of sickness for every 1 killed in battle. Deaths from disease were twice as large as those from every other known cause. The total mortality from diarrhea and dysentery alone was 57,265—13,000 more than the number of men killed in battle. The sick rate per 1000 soldiers for the year ending June 30, 1861, was 3882 cases; the trend thereafter was downward, with increases coming temporarily during the summer months and at times like October, 1862, when large numbers of new troops came into the army. For the last year of the war, the rate was 2273 illnesses/1000 men.

This was a terrible record, but not unusual for the wars of the nineteenth century, for not until World War I were medical men able to keep fatalities from disease below those from weapons of war. A long string of circumstances, in addition to the basic ones mentioned previously, almost assured any army unit of a large and continuous body of sick. Unfit men were sent into service by the thousands; their physical defects, ignored or undetected at the time of enlistment, rapidly made them subject to numerous camp affections. Only a small number in the Union Army had a rigid examination or any type of vaccination. Medical knowledge was defective in 1861; bacteriology was nonexistent; sanitation methods were crude and ineffective; none of the antitoxins had been discovered; and the role of the insect in spreading disease was still unknown.

Having arrived at camp, the soldier faced at once the danger of water contamination. The western troops drank the dirty water of the Mississippi, Missouri, and Ohio rivers or that of the smaller, although hardly less dangerous, creeks, ponds, and shallow wells. The eastern soldiers were just as careless. Occasional advice that the drinking water be boiled or filtered was usually disregarded. The camp itself was usually a disease-breeder; often pitched in a swampy area and crowded together, the masses of tents became filthy beyond description. Latrines were often uncovered, and the use of fresh earth to cover excreta was neglected. Refuse was scattered carelessly about the camp streets; the army rules of frequent washing and bathing were badly enforced. Exposure to the elements without proper clothing was also dangerous, but probably not as serious as the lack of the most elementary sanitary precautions.

The Union Army did not eat as well as its relatively plentiful prescribed rations would seem to indicate. While both fresh and "desiccated" vegetables were provided for, and additional allowances secured by purchases out of company funds,

these funds were often wasted; dried or salted foods were rejected as unpalatable and fresh vegetables were hard to get in large quantities. Sutlers who sold the soldiers such delicacies as pies and cakes, or "pizen cakes" as they were popularly translated, usually did not add anything but stomach aches to the Union diet. The efforts to establish company cooking by an experienced detail were not successful, and the usual result was rotation of the job of cook among a small unit of five or six men. The meal produced was a greasy, dirty fried mess, which often made the men ill. Basic to this picture of bad camp management was the company commander, selected usually by the men of a volunteer unit. He did nothing to alter the situation in the camp because, as an elected commander, his disciplinary hold on the men was weak. He was unable or unwilling, usually, to maintain a clean and healthy camp, find a good water supply, or insist on a good and well-prepared diet. The tremendous hold that preventable illness secured over the rank and file of the army was basically the result of bad organization and poor discipline at the company and even at the regimental level, since the officers were popular characters from back home, who allowed the men to do as they pleased. Not until two years of war had passed did commanding generals, needled by the Sanitary Commission and the better medical men of the army, take strong action to clean up the camps and make them sanitary. Grant and Sherman were especially effective in their firmness in this regard, but not until late 1862, after the terrible experiences of the Shiloh campaign and the terrific tolls of typhoid and dysentery in the Corinth, Mississippi, region, was a better sanitary record achieved.

The treatment of illness was often obstructed by a lack of definite diagnosis of the disease the man had. For instance, a man might have diarrhea, or then again, he might have dysentery. The two diseases were confused at that time, and the only distinction recognized between them, and then by only a part of the medical staff, was the presence of bloody discharges in dysentery and not in diarrhea; in medical reports the two were considered together. Since a symptom was elevated to the level of a disease, the cause and cure of "loose bowels" or the "Tennessee quickstep" were confused. Poor cooking of fried foods, the lack of fresh food, and even nervousness were suggested. Since some persons responded well to better diet containing, for example, more fresh vegetables, a relationship to scurvy was suspected; yet the disease struck hardest in the summer months, when fresh vegetables were more plentiful. Others treated dysentery as they would malaria or typhoid, when some of the symptoms seemed the same. There is little reason to doubt that among the enormous numbers of diarrhea and dysentery patients were many actual cases of what has since been diagnosed as bacillary and amebic dysentery, or that many cases showed characteristic symptoms of malaria, scurvy, or some form of tuberculosis. However, because of the vagueness and conflict in the reports, no definite conclusions can be drawn.

There was less doubt about smallpox, typhoid, and pneumonia. Typhoid caused one fourth of all the deaths from disease; it was the "great killer." There was one bad outbreak of yellow fever, of more than 760 cases and more than 300 deaths, at New Bern, North Carolina, in the fall of 1864. Cases of scarlet fever were few, but pneumonia killed almost 20,000 men of the Union Army. Diarrhea and dysentery

victims were treated with whiskey and frequent doses of salts or calomel, although many physicians followed milder treatment. Opium and strychnine were also treatments for this vague disorder. Malaria patients received whiskey and quinine as standard remedies. In treating typhoid, the physician relied heavily on stimulants and purges. In general, too much reliance was placed on drugs, even strong and sometimes dangerous ones; there is little doubt that excessive doping of sick men probably made them worse and irritated inflamed tissues more than it corrected the difficulty. Many soldiers suffered such pains from this type of treatment that, after one such experience, they took to doctoring themselves. One Union soldier stated that he kept himself in good health by keeping "dosed full of red pepper," while another cured his diarrhea by resorting to "Radways Ready Relief." It is possible that they sometimes did as well as if they had rushed to the regimental physician.

THE MEDICAL EXPERIENCE OF THE SOUTH

All of the tragic suffering of the Union soldiers was duplicated by that of the Confederacy. As in the Union Army, there was ignorance, bad management, and much needless suffering and death. Deficiencies in training, supply, and staff coordination were present in the Confederate Army, and in many cases in greater frequency than in the Union organization.

The disparity in numbers between the contestants, taken in connection with the vastly greater wealth and resources of the North, makes clear that the problem of creating and supplying armies, perplexing enough to the North, was in the end a matter of desperation in the Confederacy. Yet its military machine functioned; whipped into shape by able commanding officers, the Confederate Army for more than two years defeated all efforts to subjugate it. Chief among the problems that had to be faced by the South's staff officers was that of securing adequate medical aid for their men. This proved to be especially difficult in a region without extensive manufacturing facilities, which lacked the capital to develop the needed industries in time to win a victory.

On Feb. 26, 1861, the Confederate government created by law a general staff for the army; there were to be an adjutant and inspector general, a quartermaster general, a commissary general, and a surgeon general, with their respective staffs. The tentative nature of this act is indicated by the fact that only 10 surgeons were provided for, to assist the surgeon general, although another clause stated that as many assistant surgeons as were later thought necessary by the War Department could be added to that number. At the head of the new Medical Department, President Davis designated Dr. Samuel Preston Moore of Charleston, South Carolina. Born in 1813, Dr. Moore had graduated from the Medical College of South Carolina in 1834, and was next year appointed assistant surgeon in the United States Army, with the rank of captain. For 26 years, almost to the outbreak of the war, he performed service in a variety of difficult posts: in Mexico, in the lower Mississippi valley, and in several places in the West. For his service in the Mexican War, he was promoted to full surgeon, with the rank of major. When called to head the Confederate Medical Department, he was practicing medicine in Little Rock, Arkansas. His biographers, among them members of his own staff, have attested to his

soldierly qualities, the strict discipline he maintained, and his modesty about his own achievements. They have also praised his ingenuity and energy in building and maintaining a vast organization.

From any point of view, the work accomplished by Surgeon General Moore and his staff of more than 3000 surgeons and assistant surgeons was impressive. In one particular at least, he was more fortunate than the Union medical directors, for he was allowed undisturbed tenure in office until the very end of the conflict. Armed with long experience as a surgeon in the field, Dr. Moore confronted all the difficulties so familiar to northern medical administrators, and several others besides. He tried to eliminate the badly trained officers, many of them elected as surgeons by the men of the volunteer organizations, by establishing examination boards to pass on their qualifications.

In the Confederacy there was a general lack of everything needed to conduct a good medical department: instruments, drugs, necessary medicines, food. Yet Moore and his staff developed and administered a vast network of hospitals, including one that was said to have been the largest in the history of warfare to that time. Supplies of drugs were secured by smuggling them through the lines or by running them through the blockade. Dr. Moore prepared and had others prepare medical botanies and surgical guides for the use of his staff, and set up laboratories and distilleries in the interest of the department. He organized a society of military surgeons to circulate among his staff the valuable operational information acquired, and established the *Confederate States Medical and Surgical Journal*, which was published during 1864–1865. His department cared for more than 3,000,000 cases, a number more than four times as great as the entire Confederate Army, to say nothing of the 250,000 prisoners of war, who were generally hospital cases. But from such scattered facts, it is clear that Dr. Moore's department, although large, was dwarfed in every particular by that of the Union Army. The important thing, however, is that, small as it was, it was adequate enough to return to the commands of Lee, Jackson, and Bragg enough fighting men to prolong the struggle far beyond the period that would seem possible.

While surgery and the care of sick were subject to the same defects of ignorance and backwardness that doomed the men of the Union Army, it is amazing that the Confederate Army performed medical exploits that are rather unexpected when we consider the disparity of resources between the two organizations. Chief among these were the hospitals of the Confederate Army. In and around Richmond were some 23 hospitals of varying size and quality. The largest was set up on Chimborazo Hill, just outside the city. This consisted of some 150 buildings, well-ventilated and one story high, each measuring 100 by 30 feet and arranged in five divisions, to serve the respective needs of men from Virginia, Georgia, Alabama, and the Carolinas. Each building formed a ward and contained from 40 to 60 beds. Between the "pavilions" were neat alleys and streets. A staff of about 100 surgeons and nurses was in attendance. Chimborazo Hospital, with its patients, medical men, nurses, and guards, formed a military post under command of the director, Dr. James McCaw. Professional apothecaries were in attendance; there was a good water supply and sewage system; five ice houses and a bath house were on the grounds. Furniture for

the hospital was made in several converted tobacco factories nearby, and a Mr. Stearns, a loyal Virginian, devoted the produce of his large dairy farm to the hospital's needs. On the James River and the Kanawha Canal plied the Chimborazo trading packet, bartering for supplies in Richmond, Lynchburg, and Lexington. This fine general hospital functioned for three and one-half years, during which time 77,000 patients were treated, more than 70,000 of them being returned either to their homes or to the front.

Not all the hospitals were as well managed as Chimborazo, although many were almost as large. The Winder Hospital in Richmond covered 125 acres, had a capacity of 4800 patients, possessed its own ice houses, dairy, and bakery, and in many ways compared well with the Chimborazo Hospital. The production of the Winder Hospital bakery was so large that the excess supply was often sold to the prisoners at Libby and Belle Isle prisons. Hospitals were improvised from existing buildings, as was done in the North; the Charlottesville General Hospital utilized the buildings and many of the faculty of the University of Virginia; in Corinth, Mississippi, the large Tishomingo Hotel was converted to wartime hospital purposes. As in the case of the Union Army, hospital conditions were usually better in large cities, where there was better transportation and, in the case of Richmond, where the hospital was under the watchful eye of the surgeon general and his medical inspectors. Although no such section-wide civilian organization as the Sanitary Commission existed in the South, a number of smaller groups, such as the Georgia Relief and Hospital Association, functioned well. These acted as agencies in collecting subscriptions, which were used to purchase medicines and to provide surgical assistance to field hospitals. The Georgia organization supported four hospitals in Richmond for its state troops, and sent clothing and packages to soldiers in the field. A similar group in South Carolina worked hard to relieve its troops, and set up wayside homes along the main railway lines, where soldiers could get free meals and lodging. Both of these groups were aided eventually by large state appropriations. The Confederate Congress voted large sums to maintain its hospitals; the largest single item in its appropriation bill of May 1, 1863, was for this purpose.

Just as was the case with the Union Army, Confederate medical facilities frequently broke down completely in the field. This happened after Lee's repulse by McClellan at Malvern Hill and also in the other heavy campaigns. After the Malvern Hill engagement, Medical Director Lafayette Guild of Lee's command found himself with a huge mass of wounded, both Federals and his own men, whom he could not move; he was without drugs or anesthetics, and was not in communication with Richmond. It should be remembered that this situation resulted after a week of rapid maneuver and of terrific slaughter, sufficient to confuse the best of staff officers. Despite the disorganization of the Medical Department, General Lee commended Director Guild and many of his subordinates in general orders for their conduct during the Seven Days. That there was careful planning to prevent a repetition of these conditions is evident from the systematic arrangement for a system of receiving hospitals along the Orange and Alexandria Railroad in June, 1863, preparatory to the campaign about to be fought in the North. Difficulties of transport, however, militated against the best care of wounded during the Gettysburg campaign, since

General Lee decided that it was impossible to carry along into northern territory hospital units like the Richmond Ambulance Corps.

The military code of the time seemed to demand the presence on the battlefield of general officers, and the casualties among them were exceedingly high on the Confederate side; battle wounds killed 78 general officers, among them Albert Sidney Johnston, J. E. B. Stuart, A. P. Hill, and Stonewall Jackson, and came very near ending the careers of Joseph E. Johnston, ranking field officer in the first part of the war, and James Longstreet, Lee's best corps commander after Jackson's death. The narrow escapes of General Lee and of President Davis himself, who often rode out from Richmond to inspect an engagement, are known to all. Had not Jackson and his staff been mistaken for Federal cavalry as they rode out in the dusk at Chancellorsville to reconstitute the Confederate lines, how different a story might have been the later history of the war! As it was, Jackson lingered on for a week, under the devoted care of Dr. Hunter McGuire, to die finally from pleuropneumonia of the right lobe. On such slender threads did the success of the Confederacy depend; all that the medical men could do, in such cases, was to labor to offset the damage that had already, unfortunately, been done.

As in most modern wars, disease was the most formidable enemy with which the Confederate Army had to contend. In the Army of Northern Virginia, for example, each man suffered, on the average, three reported illnesses from July, 1861, to March, 1862, while of the 77,000 patients received at the Chimborazo Hospital during the war, 50,000, or nearly two thirds, were sick and not wounded. The men suffered from malaria, typhoid, tuberculosis, smallpox, and the measles. A badly balanced diet swelled the ranks of scurvy cases, and affections of the throat and lungs appeared when the troops moved into colder climates or when they were imprisoned in the bleak northern prison camps. Diarrhea, colic, and indigestion ravaged the camps, particularly those that had a bad water supply, or where the medical order to discard the frying pan for the stewing pan was not enforced. The physicians worked frantically to offset these bad conditions; they sought supplies of food that would combat scurvy, such as vinegar and potatoes; detachments of men were dispatched into the woods to search for sassafras, wild onions, artichokes, and other antiscorbutics. At General Moore's direction, Surgeon F. P. Porcher wrote a guide for the military botanists: *Resources of the Southern Fields and Forests.*

On the ability of the medical department to combat dietary insufficiency, wrote Director Guild in January, 1863, might depend the success or failure of General Lee's next campaign. With this conclusion the great Confederate commander was in full accord; in his letter to Secretary of War Seddon in April, 1863, he stated that the daily ration of his men was sufficient only to keep them alive, and useless in building them up for heavier exertions. The Surgeon General worked hard to circulate guidebooks among his staff to assist them in procuring foods and medicines of tonic value. Workers in the seven laboratories set up by the Medical Department to prepare medicines for the staff also worked on this vital problem. In operating distilleries to provide an alcoholic medium for new medicines, as well as to manufacture whiskey for hospital use, Moore incurred the hostility of the governments of several southern states, because they regarded his efforts as dangerous to their grain supplies.

It was inevitable, as was the case in the North, that the demands of the medical department would run counter to what seemed to be the urgent military demands of the moment. Such was the case when Dr. Moore or his subordinates felt it necessary to break the regulations regarding trading with the enemy for the purpose of securing opiates and other medical necessities from the North. One such exploit has often been related: a hearse loaded with medical supplies for the Confederates was driven past the careless guards, through the Union lines, after the battle of Shiloh. Another adventure was related of a medical officer who swam across the Mississippi, pushing before him a small craft laden with needed medical supplies. The opposition of the medical and legal authorities to this type of thing was natural, but the willingness of the medical men to put themselves in false positions with their superiors often saved lives and prevented dangerous epidemics. Cases also arose in which the medical and military authorities disagreed as to how many or which men could be spared from active service to assist the medical department as hospital or ambulance personnel. Even General Lee attacked the Medical Department sharply on this matter on one occasion; he received from the Surgeon General an equally sharp rejoinder.

All such difficulties were minor when one considers the scope of the conflict and the inexperience of the officials of the Confederacy in conducting war on a large scale. Considering the scanty means at its disposal, the medical department functioned well. Certainly no such resistance as was put forth by the Confederate Army would have been possible without the strenuous, almost desperate efforts of Dr. Moore and his aids. If, as has been said, Stonewall Jackson was the strong right arm of the high command and Jeb Stuart its keen eye, it may be equally true that the medical department provided the means and skill by which not only the arms and eyes, but the entire Confederate organism continued to function. Of their work, President Davis said: "It would be quite beyond my power to do justice to the skill and knowledge with which the medical corps performed their arduous task."

The general experience of physicians and surgeons in the field followed that of the North so closely as to give no added information of value. Every instance of bad medical administration, of poorly trained medical personnel, of inept handling of the wounded in the Union Army can be matched by similar cases in the Confederate forces. Anesthesia was also used by the Confederacy, with a preference, as in the North, for chloroform rather than ether; some surgeons doped their patients with opium and whiskey. The shortage of drugs, especially of anesthetics, was far greater in the Confederate Army, and led the medical men, as we have seen, to attempt to obtain supplies of them at almost any cost. Cities occupied by the Union Army, such as Memphis and New Orleans, were flourishing centers for illegal trade between the lines; in this trade the medical officers were heavily implicated. The commanding general of Federal troops occupying the former city said: "Memphis has been of more value to the Southern Confederacy since it fell than Nassau."

The medical men of the South were no better informed regarding the origin or treatment of infections than the northern physicians. Gangrene raged in the southern hospitals, and thousands of unnecessary amputations doubtless took place because of medical ignorance of measures to resist infection by means other than surgical.

Whether the Confederate soldier was cleaner or dirtier than his Yankee enemy is a matter of doubt, although it is true that the southerners probably had more excuse for their unsanitary habits because of the shortages of shoes, proper clothing, soap, and other supplies. The same laxity and lack of strong discipline were evident in Confederate volunteer company officers as in those of the North, and for much the same reasons.

The Confederate and Union mortalities from malarial fevers, eruptive diseases, and diarrhea-dysentery were roughly comparable in deaths/1000 men. In two particulars, the Confederate record was worse than that of the opposing army: mortality from "continued" fevers (atypical typhoid) was 11 per cent higher than in the Union Army, while pulmonary disease was responsible for 18.89 per cent of deaths in the Southern Army, but only 2.34 per cent among the northerners. Rheumatism also claimed more victims in the South than in the North, although the percentages in each were very small. In the two Armies of the Tennessee, Union and Confederate, between June, 1862, and May, 1863, the malaria cases were always more numerous among the Confederates than in the Union command, except for the fall months of 1862, when they were nearly the same. While the lists of soldiers' diseases on each side were practically identical, diarrhea and dysentery were far more prevalent in the Confederate Army than any other ailment, a fact that probably indicates the relatively poorer diet and more inadequate medical facilities among the Confederates. As in the North, disease was the Confederate soldier's deadliest enemy, and according to Dr. Joseph Jones, the ablest contemporary authority on Confederate medical matters, disease killed three Confederates to every one who died of battle wounds.

In the end, of course, no medical department or staff could have made the lot of the Confederate soldier much better. The Confederate surgeons, composing less than one third of the strength of the Union medical staff, had to minister to a force nearly half as large as that of the Union Army. The ingenious efforts of the medical men to eke out their pitifully small supplies by smuggling, by running supplies in through the blockade, by cultivating native opium, and so on, were not successful enough to make any marked difference. The medical effort was valiant and commendable, but it proved as impossible to care adequately for the Southern soldier as it was for the magnificent fighters of Marse Robert and "Old Pete" Longstreet finally to beat so powerful an enemy as the Union, with its superior manpower and resources.

CONCLUSION

What values, if any, accrued to the advancement of American medicine and public health from the experience of North and South with large-scale war? Of course, it goes without saying that the loss by death of more than 600,000 of the most vigorous young men of the nation was undiluted tragedy. For an entire generation the people of both North and South mourned for their thousands of dead; the widows, the orphaned, and the crippled survivors were to be found everywhere. The war left us with a heritage of wrecked lives, broken households, and enormous physical and moral deterioration. In the South particularly, want and devastation haunted the population for many years.

There is evidence, however, that both medical men and laymen sought to profit from the terrible experience in which they had been involved. The United States Army evolved a first rate medical service from what had been at first chaotic bungling. The system of evacuating the wounded, evolved under Medical Director Letterman, coupled with advancements in field hospitals and medical supply arrangements, became general, not only in the Union Army but in the postwar army as well, and was in use, with some additions and alterations, during World War I. The two Union Surgeon Generals, Hammond and Barnes, saw to it that every bit of known experience was recorded in the *Medical and Surgical History of the War of the Rebellion* for the use of future army surgeons. General Barnes made available $80,000 from the general hospital fund remaining at the end of the war for the purchase of books and materials for the newly organized Surgeon General's Library; he placed in charge of this great project army surgeon John Shaw Billings, whose lifetime development of the project is a milestone of American medical history. Attached to the library was a medical museum, which became an indispensable aid to all research in American military medical history. This fine center in Washington became more useful for Army medical men through the establishment under Surgeon General Sternberg in 1893 of the Army Medical School, another idea of General Hammond that finally came to fruition. Colonel Billings added to his great achievement of building up the Surgeon General's Library; he reorganized the compilation of vital statistics in the censuses of 1880, 1890, and 1900; he was instrumental in planning the great Johns Hopkins Hospital during 1875–1879; finally, he was the administrative architect of the New York Public Library, putting together the combined resources of three private collections and making of them one of the great libraries of the world.

Many Union Army surgeons stayed in service until retirement; others resumed interrupted private practice. S. Weir Mitchell and W. W. Keen became outstanding neurologists after the war; both men contributed studies to the official medical history, as did Surgeons Morehouse, Da Costa, Woodhull, and Letterman. Surgeon General Barnes remained in service until 1882, having continued the high standards established during the Hammond regime. The official medical and surgical history was rather a unique publication, since in no previous war, except the Crimean, had any government seen fit to produce such a work. The renowned pathologist Rudolph Virchow gave the official history high commendation, stating that Americans seemed able to make better use of their experiences than others had done.

Confederate surgeons, having no military position after the collapse of their government, returned to private practice or, in some cases, took service under foreign governments. This was the case of Dr. Edward A. Warren, who became surgeon in chief in the Army of the Khedive of Egypt, and concluded a long medical career in Paris, having received numerous decorations from the rulers of Egypt, Turkey, France, and Spain. His memoirs, titled *A Doctor's Experiences in Three Continents*, give one a vivid picture of a tireless and energetic medical adventurer. After the war, Dr. Joseph Jones became professor of clinical medicine at the State University of Louisiana, and wrote three excellent volumes of surgical memoirs. It is significant that one of the most extensive and ablest sections of the postwar *Surgical Memoirs* of the United States Sanitary Commission was that on hospital gangrene by Dr.

Jones. The publication, incidentally, was edited by Dr. Frank H. Hamilton, who had been a medical director in General Grant's western command.

In addition to distinguished teaching at the University of Virginia, Dr. James L. Cabell, who had directed the large Confederate General Hospital at Charlottesville, served as one of the nation's leaders in the advancement of public health. Dr. Hunter H. McGuire, Stonewall Jackson's celebrated chief surgeon, became one of the greatest surgeons and medical educators of the postwar South as chief organizer and president of the University Medical College at Richmond. Dr. Alexander Y. P. Garnett, personal physician to President Davis, continued, after the war, to practice medicine in Washington, D. C., and became president of the American Medical Association, as did eight other veterans of the Confederacy.

So wartime surgeons, Union and Confederate alike, continued for many years to serve in our medical colleges, contributed in many ways to important medical knowledge, and occupied positions of distinction. Their postwar service became an important facet of the reunion of the nation. Their collaboration, in recording their experiences, was of value to the future security of the nation.

How did medicine in general and medical education fare after the Civil War? There is much evidence to show that medical education underwent some deterioration, partly through the ruin of medical institutions in the South and partly through the movement of many people into the Far West after the war. With the coming of so many thousands of new settlers into undeveloped areas and the rapid organization of new states, educational standards of all schools, including medical schools, dropped markedly, and so did the legal control over medical practice. Proprietary schools with short and easy courses sprang up everywhere, and hordes of badly trained physicians again functioned in the laxly governed areas. Of course, not all of this was due directly to the war; however, much of the widespread social and political confusion of the postwar period definitely harmed the medical profession.

There may have been an improvement in basic surgery traceable to the presence in civilian practice of some fifteen thousand medical men who had seen military service. A sizable proportion of these, probably more than one third, had gained extensive surgical experience. Rural physicians who had always sent their operative cases to a city specialist doubtless were now more willing to chance at least minor surgery if they had served in military posts.

The coming of the war put an end to a promising public health movement that was well under way in many of the states by 1860; the last of several public health conventions, one held in Boston on the eve of the war, seemed about to blossom forth into a national public health organization when the war abruptly stopped these efforts. But the occurrence of so much unnecessary disease and suffering during the war stimulated a revival of the movement by the late 1860's. In 1869, Massachusetts established the first state board of health, which was followed within 10 years by boards in 19 other states. During organization of the American Public Health Association in 1872, a number of men who had been active in the United States Sanitary Commission and in the medical corps of both armies during the war made important contributions.

The professional nursing service was begun to fulfill the needs of the soldiers for

the care that women seemed most capable of giving them. Miss Dorothea Dix, already renowned for her work in behalf of the insane, was appointed by President Lincoln as the first Superintendent of Army Nurses. In cooperation with the Sanitary Commission, and with the help of Dr. Elizabeth Blackwell, the first American woman to secure a medical degree, Miss Dix succeeded in setting up a training service at Bellevue Hospital in New York. This was followed by the organization of a regular field nursing service at the Union base hospitals. In the 1870's this type of work became professionalized in training courses in several large hospitals.

The coming of the war caught the nation, both North and South, woefully unprepared to care for its suffering soldiers. The war's continuance stimulated the many thousands of persons implicated, both professionals and laity, to work a measure of orderly procedure out of the confusion of the times. Despite the definite retardation to civilian medicine and to the general health of our people that the struggle caused, out of it emerged the germs of the public health movement, the professional nursing service, and a markedly improved military medical organization. The greatest progress in American medicine, however, was still in the future.

BIBLIOGRAPHICAL NOTE

The most important official source for Civil War medicine is the extensive *Medical and Surgical History of the War of the Rebellion* in 6 volumes, important sections of which were written by Union Army surgeons (issued during 1870–1888 by the Surgeon General's Office); much valuable material is also to be found in *Surgical Memoirs of the Rebellion*, 2 volumes, Cambridge, 1870–1871, also a compilation and published by the United States Sanitary Commission. Much light is shed on the administration of medical matters on both sides by dispatches, orders, and copies of relevant legislation in *Official Records of the Union and Confederate Armies*, 130 volumes, Washington, 1880–1891. The Confederate side of the picture, scantily treated in the *Official Records*, is partly filled out by various printings of the *Confederate Statutes at Large* and by *Regulations of the Confederate Medical Department*, Richmond, 1861. Also valuable are the various issues of the *Confederate States Medical and Surgical Journal*, Richmond, 1864–1865, which give factual data on difficult medical and surgical problems arising in southern hospitals.

The general literature of the Civil War, while very large, gives us very little information of medical import, being almost entirely preoccupied with the military and political problems of the conflict. Also of doubtful value are the many memoirs and personal records, even those written by medical men, which stress matter other than medical and usually are concerned with a very small portion of the action. A good account of Confederate medicine is contained in W. B. Blanton: *Medicine in Virginia in the Nineteenth Century*, Richmond, 1933; also valuable is the 7th volume of F. T. Miller, editor: *Photographic History of the Civil War*, New York, 1912; outstanding is (Medical Director) Jonathan Letterman: *Medical Recollections of the Army of the Potomac*, New York, 1866, and equally enlightening for the Confederacy is Joseph Jones: *Medical and Surgical Memoirs*, New York, 1890. A fair account of the Union Army's medical work is to be found in Colonel P. M. Ashburn: *History of the Medical Department of the United States Army*, Boston and New York, 1929. The careers of many Civil War physicians on both sides are sketched in Morris Fishbein: *History of the American Medical Association*, Philadelphia and London, 1947. B. I. Wiley's delightful volumes: *The Life of Johnny Reb* and *The Life of Billy Yank*, Indianapolis, 1943 and 1951, contain valuable information on health conditions of both armies.

The only competent single volume on Union medicine is G. W. Adams: *Doctors in Blue*, New York, 1952; for Confederate medicine, a brief monograph by the author of this paper, "Caring for the Confederate Soldier," *Medical Life 42:* 443–508, Sept., 1935, is now out of print and is being revised for future publication. Shorter versions of the foregoing are to be found in *Military Affairs 1*:46–54 and in *Army Ordnance 17*: 33–35. See also G. W. Adams: "Confederate Medicine," *Journal of Southern History 6*:151–166. H. H. Cunningham: *Doctors in Gray* is about to be published.

The Evolution of American Medical Literature

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The earliest Americans were rebellious or adventurous transplants of a European culture, mainly English. These peoples, having constant contact with Europe, maintained in this new world a relatively European culture and outlook. Their literary heritage was no less European, being largely influenced in speech and writing by the then newly translated King James Version of the Bible.

The earliest American literature included the books of those first settlers and explorers who described their experiences in a new environment in the language and accent of their homeland. The writings included medical observations, which in a loose sense may be considered the ancestry of our present medical literature. Of "pure" medical literature there was only one broadside in the seventeenth century and nothing of any scientific stature until after the American Revolution. Nevertheless, an assessment of our earliest medical writings is of special importance to an understanding of the historical and bibliographical parentage of our present-day literature. Understanding of the genetic background is essential also in evaluating the progress of medical literature in this country.

An Account of Two Voyages to New England written by John Josselyn in 1674 provides us with an excellent and typical example of one of these first American writings. Mr. Josselyn's account of the travails of New World traveling contain quaint descriptions of indigenous medical practices. John Josselyn's most accredited book, *New England Rarities Discovered* . . . , published in 1672, contained the first systematic account of the botanical species in New England.

In the century after the settling of Jamestown in 1607, the new and the old worlds were separated by much more than some 3000 miles of water. The efforts of the American settlers were directed to the primary task of physical survival in a new and difficult environment. Their very presence in America bespoke—for the most part—their assertion of individualism, but the formidable tasks facing these first settlers left them little time or inclination for the philosophical speculations so fruitfully occupying European intellectuals.

This was England's glorious era when such immortals as Shakespeare, Milton, Newton, Bacon, and Locke flamed their passage across the pages of history. This resurgence was contagious, infecting France and Germany in lesser degree, consistent with the firm control still exercised in France by the monarchy and ecclesiasticism and with the devastation of the 30 Years' War in Germany. France gave us Descartes and Molière; and Germany, Spinoza and Bach. In Spain flourished Velázquez and Cervantes and in Holland, Rembrandt and Leeuwenhoek.

Science and medicine, shaking loose from the stranglehold imposed by blind adherence to the postulates of the past, emerged unfettered and questioning. This

century of magnificent achievement fittingly and auspiciously opened with the publication of William Gilbert's "De Magnete" (1600).

There were very few medical practitioners to be found in this country in the early seventeenth century. Many were the disadvantages accruing to such persons who left their native lands for our wilderness. The settlements were sparsely populated and could not, in ordinary commerce, support a physician. The few physicians who found their way here were generally ship physicians, and these usually did not remain for long. Thus medicine became most frequently an ancillary occupation. It was therefore not surprising that the treatment of the sick became the responsibility of the educated, and this group was represented largely by the clergy, who were the best equipped to administer to the sick by virtue of the medical training that was included in their curricula. Governors and teachers trained in European universities were also active in medical management, but in lesser numbers. As most of those practicing medicine were clergymen, the term "doctor" was not even employed in this country until 1769. And the writings of the clergy accounted for the great majority of our earliest "medical" literature.

THE COLONIAL PERIOD

The Reverend Thomas Thacher (1620–1678) authored the first purely medical publication in this country. This was a one page folio broadside entitled *A Brief Rule to Guide the Common People of New England How to Order Themselves and Theirs in the Small-Pocks or Measels*. Only one copy of this document exists today, and it is preserved by the Massachusetts Historical Society.

To keep the record clear, it is necessary to retrogress briefly in time, for the first recorded medical writing in the Americas was Francisco Bravo's *Opera medicinalia* published in Mexico in 1570. This dealt with the disease *tabardillo*, venesection in pleurisy, critical days in disease, and the use of sarsaparilla as a remedy. The first medical book to appear in South America was Francisco Figueroa's *Dos Tratados*, etc., which was published in Lima in 1616, and known only by title, as no copy is known to exist (at present). After Thacher's folio broadside there were no other medical writings in this country in the seventeenth century, and relatively few in the next century.

The hallmark of medical literature in this era was the medical pamphlet, authored as we have noted by the nonmedical practitioner. What literature was produced was spurred by practical considerations with respect to contemporary diseases or epidemics. While the colonists by and large were busy securing a precarious agricultural existence against the harsh deterrents of a primeval environment, the sickening forces of epidemic disease multiplied their hardships. In such surroundings the practitioners of medicine had little freedom to cultivate the liberal and leisurely arts and even less opportunity for writing. Perhaps the circumstances excuse the evanescent and infrequent appearances of medical writing during this period and the pamphlet format of the writings that did appear.

Smallpox was a particularly vicious and recurring evil in the colonies and was responsible for a considerable and relatively important medical literature. Indeed,

Thacher's broadside concerned itself with this disease. Smallpox first appeared in Massachusetts in 1633, and in Boston in 1649 with devastating consequences.

In this country the man who pioneered the attack on this dread disease, and thereby earned the right to be considered by many as American medicine's first significant figure, was Cotton Mather (1663–1728). Mather, a multifaceted individualist who combined vengeance against witches with a zeal for medical reform, was educated at Harvard and studied for the ministry. His literary output was prodigious. Although his original editions are scarce and often fragmentary, 468 of Mather's printed and published works have been listed by his bibliographer Holmes. Mather's active scientific interest was rewarded by his election as a Fellow of the Royal Society, an honor shared by less than a dozen other Americans at that time. Cotton Mather's most valuable medical contribution was his introduction of inoculation into America. He had learned of the practice of variolation by reading the abstracts of tracts that appeared in the Philosophical Transactions in 1714 and 1716, and had heard stories of the not uncommon practice of variolation in Africa as related by Negroes imported to this country. Therefore, when a West Indian ship brought smallpox to Boston in 1721, he seized this opportunity to encourage inoculation. As a result of Mather's encouragement, Dr. Zabdiel Boylston, on June 26, 1721, became the first person to inoculate for the smallpox in this country. In the *Boston Gazette* of Oct. 30, 1721, there appeared an anonymous article of 15 paragraphs entitled "A Faithful Account of What Has Occur'd under the Late Experiments of the *Small-Pox* Managed and Governed in the Way of *Inoculation*. . . ." This article, a rarity today, was written by Cotton Mather in collaboration with Zabdiel Boylston. In the same year, Cotton Mather either wrote *in toto*, or contributed to, at least three other articles on this subject, and in the next year, at least five more.

On the basis of his *Address to the Physicians of Boston* (April, 1721), which recommended variolation, we are justified in crediting Mather with the introduction of this lifesaving procedure into America. Dr. Boylston, who courageously followed the suggestion of Mather, received more recognition in England than in his own country and was invited to visit England in 1724. The results of his inoculations were published in London in 1726 in a pamphlet entitled *Historical Account of the Smallpox Inoculated in New England* wherein he reported a mortality of approximately 2 per cent in a series of almost 300 cases. His ensuing fame suffused back across the Atlantic, and during a later smallpox epidemic, in Boston in 1730, an American edition of his book was published.

Inoculation was still strongly opposed by the physicians of Boston. The champion of this opposition was Dr. William Douglass, a Scotsman, who wrote a series of anti-inoculation articles such as "The Abuses and Scandals of Some Late Pamphlets in Favour of Inoculation of the Small Pox, etc." (1722). Even Benjamin Franklin, as copublisher with his brother James of the *New England Courant*, took an active position opposing inoculation until 1736, when the death of his 4 year old son from the disease convinced him of the error of his thinking. In 1759 Franklin wrote a little-known foreword to a tract by William Heberden, "*Some Account of the Success of Inoculation for the Smallpox in England and America*," which gave a fair summary of the status of inoculation at that time.

Benjamin Franklin, who has been described as the first civilized American, was a man of extraordinary and varied talents, but here we are particularly concerned with his role in medical literature, which was not inconsiderable. Franklin's medical essays are of great importance and reveal his scientific inquisitiveness and native practical application of an uncommon common sense. In a letter to his brother in 1752, Franklin described a flexible catheter, which had actually been described 32 years earlier by Francesco Roncalli Pavolini, but it is hardly likely that Franklin was familiar with this article. Franklin also noted the effects of electricity in paralytic cases as early as 1757 and reported this phenomenon in a letter to John Pringle, but his *Experiments and Observations on Electricity* was not published until 1769. It was Franklin who was primarily responsible for the founding of the first American hospital in 1751, described in his *Brief Account of the Pennsylvanian Hospital* (1754).

Franklin was not one to bear passively the expected burdens of old age, and in 1775, when he noticed that his eyesight was failing, he proceeded to invent a pair of spectacles for himself (in 1776) with each glass containing two lenses joined together by a central horizontal line. And thus were invented the first bifocal lenses, "the upper lens for distance and the lower one for near vision." He described and illustrated them in a letter to George Whatley, Esq., written May 23, 1785, saying "I had the glasses cut, and half of each kind associated in the same circle. By this means, as I wear my spectacles constantly, I have only to move my eyes up and down as I want to see far or near, the proper glasses being always ready." The manuscript letter is now in the Library of Congress.

As we have seen, even well into the eighteenth century there were very few university-trained medical practitioners. The great majority of these were trained under the apprenticeship system, which dated back to the Middle Ages. Actually, at the time of the American Revolution, it was estimated that only 200 of the approximately 3500 practicing physicians were university-trained. Nevertheless the soil was ripening for a social change. In *A Proposal for Promoting Useful Knowledge among the British Plantations in America* (1743), Franklin noted that "the first drudgery of settling new colonies, which confines the attention of people to mere necessaries, is now pretty well over; and there are many in every province in circumstances that set them at ease and afford leisure to cultivate the finer arts, and improve the common stock of knowledge." And so, as living conditions improved in the country, it became considerably less difficult to attract foreign physicians, and at the same time there was an increased migration of colonial students to foreign medical schools.

Some of the more prominent physicians to come to the United States during that period were Cadwallader Colden, John Lining, Samuel Clossy, Peter Middleton, and Lionel Chalmers. These men elevated the standards of medicine in this country and often trained our colonial American physicians.

Cadwallader Colden (1688–1776) wrote several of the important medical texts of his era including *An Account of the Diseases and Climate of New York* (1720) and an essay on the iliac passion (1741). He also published a *Treatise on Wounds and Fevers*, which was long considered the standard authority on the subject. Dr. Colden was one of the first to recommend the cooling regimen for fevers and should be recognized for opposing the prevailing method of treatment for smallpox.

Benjamin Franklin published another important medical pamphlet with the intriguing title *Essay on the West-India Dry-Gripes; with the Method of Preventing and Curing that Cruel Distemper* (1745). The author was Thomas Cadwallader (1708–1799), who was describing the symptoms of lead poisoning due to the imbibing of rum punch. It has been said that "this beverage was made from Jamaica Rum, and was the fashionable drink, until pointed out as giving rise to the disease in question, which it did, in consequence of containing poisoning qualities deriving from the leaden pipes which were used in its distillation."

In Charleston, South Carolina, a former Scotsman, John Lining (1708–1760), was conducting some interesting experiments and writing important articles. In 1740, he weighed himself each morning and night, while weighing his food intake and urinary and alvine discharges simultaneously. He published the results of these experiments in the *Transactions of the Royal Society* in 1743, and his paper was considered of real value. According to Thacher, Lining published the first account of yellow fever in this country (1753), and if this is true, it was probably the first medical paper published in the South.

The rise of American medical schools was accompanied by a corresponding outpouring of important medical literature. In 1765 appeared John Morgan's "Discourse upon the Institution of Medical Schools in America." This was the first, and probably the most influential, paper in American medical education. This address is remarkable for the range of its suggestions and the loftiness of its ideals. In this notable discourse, Morgan declared that anatomy was the foundation stone of medicine, but he also strongly recommended the study of materia medica and botany and suggested the study of pharmaceutical chemistry, which, he said, deals with "the separation of the parts of medical substances from one another, and of the new properties arising from the composition or resolution of these bodies." In addition, Morgan recommended the study of the theory of practice including physiology and pathology, and finally, he espoused the clinical application of the basic medical sciences. It is notable that 200 years have not basically changed, in general concept, the curriculum he then outlined.

This "Discourse" set a high standard and suggested a practical plan for medical education in the colonies. For example, following these suggestions, Dr. Thomas Bond initiated in 1766 a series of clinical lectures at the Pennsylvania Hospital.

In 1769 appeared Samuel Bard's *A Discourse upon the Duties of a Physician*, the first American publication on medical ethics and antedating Percival's classic on the same subject by 25 years. In this address, Dr. Bard set forth high standards for the conduct of life and for professional relationship between physicians and also for relationships of physicians with the poor. The quotation from Cicero, "Homines ad Deos, nulla re proprius accedunt, quam Salutem Hominibus dando," which opened his discourse, now adorns the Academy of Medicine building in New York City. Another of Dr. Bard's writings, *An Enquiry into the Nature, Cause and Cure, of the Angina Suffocativa, or Sore Throat Distemper* (1771), was considered by no less an authority than Osler as an American classic "of the first rank." Dr. Bard is also credited with writing the first American textbook of obstetrics, *Compendium of the Theory and Practice of Midwifery* (1807).

Dr. Peter Middleton, in 1769, wrote our country's first paper on medical history, a pamphlet entitled *A Medical Discourse, or an Historical Inquiry into the Ancient and Present State of Medicine*. This was delivered at the opening of the Medical School in New York City and published in 1769.

Samuel Bard and Peter Middleton were two of a triumvirate described as the most eminent physicians in New York in the era before the Revolution. The third member was John Jones, professor of surgery in the New York Medical College and the author of the first American book on surgery. Dr. Jones had many illustrious patients. In 1790, for example, he attended George Washington, and "in a few days the President was out of danger." Dr. Jones attended Franklin in his last days, and the description of the illness suggests that the diagnosis may have been either a myocardial or pulmonary infarction; "about sixteen days before his [Franklin's] death, he was seized with a feverish disposition, without any particular symptoms attending it till the third or fourth day, when he complained of a pain in the left breast, which increased until it became extremely acute, attended by a cough and laborious breathing."

Dr. Jones's book *Plain Concise Practical Remarks on the Treatment of Wounds and Fractures* was published in 1775, and although Thacher praises it, saying that "the advantages which the surgeons of the army derived from this valuable production are incalculable," it was actually only a compilation derived from the surgical texts of Ranby, Pott, and others. The book was well received and subsequent editions were published in 1776 and 1795. Dr. Jones's report of a case of trephining, followed by hernia cerebri, was the only really original observation in the book; nevertheless, the book derives its importance from having been the first surgical book to be published in America.

MEDICAL LITERATURE OF THE REVOLUTION

Many famous physicians had been actively engaged both politically and medically in the historic events that eventually culminated in the overthrow of British power in this country and the establishment of the United States of America. Six physicians were among the 56 persons who signed the Declaration of Independence; the six were Josiah Bartlett, Oliver Wolcott, Lyman Hall, Mathew Thornton, George Tyler, and the most eminent of all, Benjamin Rush.

Benjamin Rush was most generously described by Samuel D. Gross as "the father not only of American Medicine, but of American medical literature." Dr. Rush has been a controversial figure and his importance has been accentuated or downgraded according to the criteria and prejudices of his critics. His influence was nationwide and his achievements prodigious. His literary output was voluminous; space permits the mention of only a few of his more important medical contributions. Dr. Rush's *An Account of the Bilious Remitting Yellow Fever* (Philadelphia, 1794) gives a contemporary and exact description of a devastating epidemic disease. During the Revolution in 1778, he wrote *Directions for Preserving the Health of Soldiers*, which recorded his far-advanced opinions concerning the value of personal cleanliness and general sanitation. Dr. Rush reported that soldiers were less often sick when mobile

and when in the open air. He recognized the relationship of the marshes to illness, urging that troops not be quartered near marshy ground.

Shortly before his death, in 1812, Dr. Rush published his *Medical Inquiries and Observations, Upon the Diseases of the Mind*, and on the basis of the remarks therein has rested his canonization as father of American psychiatry. In this book, as ably reported by Dr. J. C. Wilson, Dr. Rush recognized "the physical, mental and moral causes of insanity. . . . He regarded disorders of the minds as forming part of the general course of medicine, and . . . insisted upon their being placed in the curriculum," a point of view only recently accepted and practiced in our American medical schools.

The literature of the Revolution was produced "in the field," as it were. We have already mentioned the books of John Jones and Benjamin Rush. To these we should add the *Military Journal* of James Thacher and the *Economical Observations on Military Hospitals and the Prevention and Cure of Diseases Incident to an Army* of James Tilton. After surveying the shocking conditions of the army hospitals during 1777 and 1778, Dr. Tilton submitted his plan for the proper conduct of hospitals. He described the promiscuous torrent of sick and wounded inundating the general hospital at Princeton College with resulting widespread infection followed by a fearful mortality. Dr. Tilton stressed hygienic methods such as exercise, bathing, care of privies, and clean clothing and bedding, which "should be kept sweet and comfortable." He furthermore averred that "the influence of the mind upon the body" was "astonishing," and made the equally cogent observation that "limbs might be saved which the best authorities directed to be cut off."

James Thacher, whose medicoliterary fame rests solidly on the importance of his pioneer *American Medical Bibliography* (1828), was also the author of a fascinating book that gives us probably our most accurate and picturesque information concerning the beginnings of American military medicine. Dr. Thacher, while serving as surgeon's mate at Ticonderoga and in the Burgoyne Campaign, kept a journal whose entries form the basis of his *Military Journal*. This book describes, in intimate and personal detail, medical conditions during the war; the almost complete absence of surgical equipment, amputations performed without anesthesia, the patient merely chewing a bullet as the pain grew worse, and the ravages of smallpox. Dr. Thacher reported that 187 men in his regiment "were subjects" of smallpox, but that only 4 of 500 who were inoculated for this disease died.

The actual fighting of the Revolution finally came to an end in 1781, and when the Treaty of Paris was signed in 1783, the colonies became a new nation. Smallpox, however, was still a foe to be reckoned with until Edward Jenner published his classic *An Inquiry into the Causes and Effects of the Variolae Vaccinae*. In 1799 a copy of this book was forwarded from London to Benjamin Waterhouse, who was to introduce the benefits of vaccination into this country in his article "Something Curious in the Medical Line" (*Columbian Sentinel*, March 2, 1799). In a lengthy pamphlet entitled *A Prospect of Exterminating the Small-Pox* . . . (1800), Dr. Waterhouse told how "on perusing this work [Jenner's "Inquiry"] I was struck with the unspeakable advantages that might accrue to this country and indeed to the human race at large from the diffusion of a mild distemper that would ever after secure the constitution

from that terrible scourge the Small pox." As a result of his pioneer use of smallpox vaccine in this country, Dr. Waterhouse became known as the American Jenner, but recent studies have thrown doubt on his medical altruism and have suggested Dr. Waterhouse's opportunistic use of vaccine for personal financial gain.

Before ending the discussion of the eighteenth century, a further word about epidemics and epidemic literature. After the American Revolution, the periodical internecine onslaughts of epidemic fevers continued to harass the new nation. The major epidemics became source material for the early American literature, and yellow fever contributed its share.

A number of accounts of yellow fever epidemics were written. In 1761 John Lining published *A Description of the American Yellow Fever*, and in 1793 Matthew Carey wrote *A Short Account of the Malignant Fever, Lately Prevalent in Philadelphia*. In 1792 there appeared a little-known work written by William Currie (or Curry) entitled *Historical Account of the Climates and Diseases of the United States*. The book included reports from practitioners throughout the country describing their local epidemics. The book excels in its description of the yellow fever outbreaks. Dr. Currie was a very busy pamphleteer and also wrote a book entitled *View of the Diseases Most Prevalent in the United States* (1811).

The most important and influential epidemiological work of the eighteenth century was a two volume set published in Hartford in 1799. Its author was without medical education or orientation, but his effort was described by Osler as "the most important medical work written in this country by a layman." The writer was Noah Webster and his book, *A Brief History of Epidemic and Pestilential Diseases*. Although this book includes several excusable errors, it is nevertheless a comprehensive compilation of factual and descriptive material relating to pestilential epidemics in general, including those of contemporary American origin. The book includes a fine history of yellow fever. Webster wrote in his preface, "When I began my enquiries into the origin of the yellow fever, in 1795, I had no preconceived system to maintain. My view was to collect facts and from them to deduce truth. . . ." This was a commendable and highly scientific attitude and one he followed scrupulously.

THE INAUGURAL DISSERTATION

We cannot overlook the place of the inaugural dissertation in our medical literature, despite the unkind remarks of the great American medical historian, Gross, who, probably with justification, belittled the literary value of such work. The inaugural dissertation was an old world custom perpetuated, like so many other customs, by our earliest medical graduates. And although most of these dissertations were worthless or at best of dubious value, there were some of medical or historical interest. Even Dr. Gross noted that the first attempt to place the treatment of intestinal wounds "in a true light" was recorded in the inaugural dissertation by Thomas Smith on" Wounds of the Intestines." Another dissertation, written by Charles Caldwell, bears the distinction of having been considered the first pediatric monograph published in this country (1796). Dr. Caldwell wrote more than

200 titles, including his famous *Autobiography*. A thesis that would appear to antedate Caldwell's by one year was "An Inaugural Dissertation of the Diarrhoea Infantum" by Peter Anderson (1795). The first American work touching on bacteriology was an inaugural dissertation, "On the effects of Contagion upon the Human Body," written by Lewis Condict (May 19, 1794). The first article on analgesia in childbirth to appear in the United States was an inaugural thesis entitled "Essay on the Means of Lessening the Pains of Parturition." In 1833 Henry Bogart submitted an inaugural paper on "Angina Pectoris," indicating his familiarity with the work of William Heberden. To the relief of medical students as well as examining bodies, the requirement of a dissertation for medical certification gradually and finally disappeared.

THE ADVENT OF THE MEDICAL JOURNAL

There emerged in the last years of the eighteenth century an important new development in American medical literature—the beginnings of American medical journalism. Before the advent of the journal, there was no scientific mass medium available to the American medical practitioner who wished to publicize his findings, and he was therefore forced to have his material printed at his own expense, usually in pamphlet form. The medical journals provided this medium.

From their beginning, American medical journals have prospered in number and importance. The accounts of many of the greatest American contributions to medicine have appeared first in our journals. Today many of these publications are world-famous. Osler has evaluated the *American Journal of the Medical Sciences* as "one of the few great journals of the world" and has indicated that "one can almost write the progress of American medicine during the past [nineteenth] century" from the pages of this respected journal. Although many of the earliest journals were short-lived, they were quickly replaced by others, so that by 1850, there were 117 medical journals being published in this country, whereas there had been only one before 1800. It is not possible to present here a detailed history of all or even a majority of these journals; however, several of the more important journals will be discussed from the viewpoint of their contribution as medical literature.

The first truly American medical journal appeared for the first time on July 26, 1797, under the name *Medical Repository*. Although there were 176 publications devoted to medical literature elsewhere in the world in the year 1800, the *Medical Repository* was the only American representative. During its publication, which ended in 1824, it presented several important papers, and its popularity was demonstrated by the demand for several editions. The first modern description of hemophilia, written by John Conrad Otto, appeared in volume VI (1803) under the title "An Account of an Haemorrhagic disposition existing in several families." Dr. Otto, incidentally, also wrote the first American article on epilepsy.

In the decade after the appearance of the *Medical Repository*, six additional medical journals were published. These included the *Charleston Medical Register*, edited by David Ramsey (1803), the *Philadelphia Medical Museum*, produced by John Redman Coxe in 1804, the *Philadelphia Medical and Physical Journal*, founded in 1804 by Ben-

jamin Smith Barton, the *Baltimore Medical and Physical Recorder*, started in 1808 and published less than a year, and the *New York Medical and Philosophical Journal*, published in New York from 1809–1811, finally succumbing to the competition of the *Medical Repository*.

In Boston in 1812 appeared the famous *New England Journal of Medicine and Surgery*, which, merging with the *Boston Medical Intelligencer* in 1828, became our first weekly medical journal under the masthead of the *Boston Medical and Surgical Journal*. This publication printed the first public notices of the use of ether in surgical anesthesia in 1846, and its existence and high repute have been uninterrupted to date. In 1928 its name was changed to the *New England Journal of Medicine*.

One of the leading American medical journals, the *American Journal of the Medical Sciences*, was the result of a fusion in 1828 of the *Philadelphia Journal of Medicine and Physical Science* (founded by Nathaniel Chapman in 1820) and the *Philadelphia Monthly Journal of Medicine and Surgery*.

Daniel Drake, one of the greatest names in American medicine, is associated with one of the first medical journals to be published west of the Allegheny Mountains—the *Western Journal of the Medical and Physical Sciences*. The first cesarean section in America was reported in this publication in 1830. It had been performed three years earlier by John Lambert Richwoods on a "fat colored primipara with a contracted pelvis." This journal, which later became the *Western Journal of Medicine and Surgery*, was the most important of those in the West and contained many of Dr. Drake's major writings including his papers on intermittent fever, hepatitis, and pneumonitis.

Many of the early American medical journals were not destined for either a long or a fruitful existence. A majority of those founded before 1850 lasted less than three years. Several, like the *Eclectic Repertory*, were saved from total oblivion by the chance inclusion of outstanding articles. Thus, the *American Medical Recorder*, edited by John Eberle, published in 1825 William Beaumont's unsolicited manuscript concerning the physiology of the fistulous stomach of the Canadian trapper Alexis St. Martin, which preceded by eight years the publication of Beaumont's classical work on digestion in book form.

The first southern journal appeared in 1831; it was a quarterly named the *Journal de la Société Médicale de la Nouvelle Orléans*. The first medical journal west of the Mississippi was the *St. Louis Medical and Surgical Journal*, founded by M. L. Linton in 1843.

As the years went by, the American medical journals were to include our foremost significant medical contributions, and today, in all likelihood, the journals form the most valuable part of our medical literature.

THE FIRST HALF OF THE NINETEENTH CENTURY

The impetus to American medicine, gratuitously bestowed by the American Revolution, was carried on into the nineteenth century. Rumblings of scientific aspirations were heard, but almost half of the century was to elapse before the first great American achievement in medicine would be presented to the world.

In the first half of the nineteenth century the outstanding achievements were made by Frenchmen, including Laennëc's invention of the stethoscope (1819), Bouillaud's

establishment of the relationship between acute articular rheumatism and heart disease (1836 and 1840), Corvisart's resurrection in 1806 of Auenbrugger's classic on percussion (1761). The Irish school boasted of Adams' account of heart block (1826), Graves's work on exophthalmic goiter (1835), and Stokes's elucidation of the mechanism of Cheyne-Stokes respiration (1846).

In England, Richard Bright distinguished between cardiac and renal edema (1827), and Thomas Addison described pernicious anemia (1849) and further advanced his thesis in 1855 with the publication of his book on *The Constitutional and Local Effects of Disease of the Suprarenal Capsules*. In England also were James Parkinson, Thomas Hodgkin, and James Hope, who added to the luster of England's scientific reputation.

There were no comparable achievements in this country during the same period, except for the epochal discovery of the practical application of anesthesia to surgery in 1846, but the general level of work was much higher than it had been and progress and improvement were rapid.

Perhaps the most picturesque, and possibly the most important, of the American physicians of the first half of the nineteenth century was Daniel Drake, whom Garrison called, "the greatest physician of the West." The achievements of this remarkable man strain the limits of belief. In 1810 Dr. Drake wrote *Notes Concerning Cincinnati*, which contained the first medical writing to be published in the West. Dr. Drake's series of essays on medical education, which were begun in 1829, remain unsurpassed to the present time. Dr. Drake's most outstanding medical literary contribution was the two volume *Systemic Treatise, Historical, Etiological and Practical, on the Principal Diseases of the Interior Valley of North America* (volume I, 1850; volume II, 1854). S. D. Gross described these volumes as being as "durable as the mountains and the valleys whose medical history they are designed to portray." This two volume set was the result of 30 years of personal observation during the course of Dr. Drake's extended travels. The first volume is an encyclopedic discussion of the medical geography of the Mississippi Valley. The second volume, which is the rarer, concerns the epidemiological relationship to geographical and botanic conditions. The great medical historian, John Billings, considered this book a remarkable achievement surpassing anything preceding it and he described it as peculiarly American "in subject, mode of treatment, and style of composition."

In 1841, Dr. Drake wrote a fascinating account of a disease called the "trembles" or "milk sickness," which has since become a starting point for many discussions as to the exact nature of the disorder. His writings were wide in scope, including articles on mesmerism (1844), moral defects in medical students (1847), "The Climate and Diseases of Cincinnati" (1810), and even a "Narrative of the Rise and Fall of the Medical College of Ohio" (1822). One of his last works was a pamphlet entitled *Discourses Delivered by Appointment, before the Cincinnati Medical Library Association* (1852). The first discourse concerned early medical conditions in Cincinnati and the second discourse dealt with American medical periodical literature.

"On the 1st of August, 1825, at 12 o'clock M. I introduced through the perforation between the ribs, into the stomach of Alexis St. Martin, the following items of diet, suspended by a silk string, and fastened at proper distances from each other, so as to pass in without giving pain—to wit: a piece of high-seasoned *alamode* beef, a piece

of raw *salted lean* beef, a piece of raw salted *fat pork*. . . ." Thus began the description of the first actual study of human digestion and the movements of the stomach in situ. The first of two quaint notices of this remarkable case history appeared in the January 25 (1825) issue of the *Medical Recorder*.

With the publication of his book *Experiments and Observations on the Gastric Juice and the Physiology of Digestion* in Plattsburg in 1833, William Beaumont became internationally known. At the same time, he surprised the world with the caliber of American medical research under such relatively primitive conditions. The adventurous tale of the relationship between William Beaumont and his patient Alexis St. Martin has often been told, but for those unfamiliar it is a story well recommended. Dr. Beaumont's classic represented a milestone in the history of American medical literature, as it was the first of America's scientific contributions of world importance; in writing this book, Beaumont established himself as the pioneer of American experimental physiology.

In the first half of the nineteenth century, the medical "monopoly" of the New England states began to lessen with westward migration. Daniel Drake did much to shift the balance of important contributions in medicine, and Ephraim McDowell was Drake's prototype in the field of surgery. When he was 24 years old, Dr. McDowell began to practice medicine and surgery in Danville, Kentucky, a small town surrounded by wilderness. From such relatively crude beginnings, Ephraim McDowell became the accoucheur, both literally and figuratively, at the birth of abdominal surgery in December, 1809. The oophorotomy that made him famous was performed through a nine inch incision "over the crest of the tumor on the left side three inches from and parallel to the rectus abdominis." The entire operation took only 25 minutes and the patient recovered. Dr. McDowell's account of this appeared in the otherwise undistinguished *Eclectic Repertory*. A follow-up of two additional cases was published in 1819, and Dr. McDowell performed three additional ovariotomies, the last in 1826.

Dr. McDowell received little acknowledgment of his contribution during his lifetime, but in 1879 he was eulogized by Sir Spencer Wells, who named him "the Father of Ovariotomy," and he has been subsequently recognized as the founder of abdominal surgery. Dr. McDowell's two contemporarily inconsequential articles in the short-lived, little-known *Eclectic Repertory* are now recognized as two of the finest jewels in the diadem of American medical literature. America was to become preeminent in surgery and Dr. McDowell had shown the way.

Although he was a leading physician of his time, Oliver Wendell Holmes is best known and respected by the lay public as a great poet. Nevertheless, his contributions to medical literature were considerable in scope and in importance. It was Dr. Holmes who, in a letter to Morton on Nov. 21, 1846, suggested the name anesthesia, which, he said, "signifies insensibility more particularly . . . to objects of touch," but his most significant medical work was his paper "On the Contagiousness of Puerperal Fever" published in the *New England Quarterly Journal of Medicine and Surgery* (1843), a journal that survived less than a year. In this article Dr. Holmes pointedly suggested that parturient women should not be attended by physicians who had been conducting post-mortems or who had recently been in attendance on

patients with infectious diseases. Emphasis was placed on the role of cleanliness in the prevention of puerperal infection. Although Semmelweiss deserves credit for the more scientific proof of the association of sepsis and puerperal fever, Dr. Holmes made his suggestions five years earlier.

Dr. Holmes's other important contribution was to medical history. He wrote many historical essays for the contemporary journals and these were issued collectively as *Medical Essays* in 1883. This volume was the outstanding book on medical history of its decade. Dr. Holmes was a prolific author and his facility with the pen matched his literary ability. In 1842 he published his lectures "Homoeopathy and Its Kindred Delusions," a scathing indictment and exposé of that particular system of medicine. Dr. Holmes also wrote many other medical theses.

THE ETHER CONTROVERSY

In the *Eugenics Review* of 1914, Francis Darwin affirmed his conviction that "in science the credit goes to the man who convinces the world, not to the man to whom the idea first occurs." It is largely on this generally accepted dictum that the credit for the first really epochal American contribution to medicine must be attributed to William Morton. Osler put it succinctly when he wrote "before Oct. 16, 1846, surgical anaesthesia did not exist; within a few months it became a world-wide procedure; and the full credit for its introduction must be given to William Thomas Green Morton, who, on the date mentioned, demonstrated at the Massachusetts General Hospital the simplicity and safety of ether anaesthesia. . . . Morton convinced the world; the credit is his!"

The history of the successful use of anesthesia in surgery for the production of insensibility to pain is very complex, involving four major claimants, and the story has already been exhaustively reported by Bigelow and Packard. Time has rightfully bestowed the honors on Dr. Morton, but the claims of the other three persons vitally involved do have a limited scientific validity and certainly great historical interest. These three men were Horace Wells, Crawford W. Long, and Charles T. Jackson. Were the story of the discovery of modern anesthesia to be dramatized, it would require the literary skill of a John Webster to give it credence, for the lives and deaths of the men involved in the ether controversy were tragic and macabre.

Crawford W. Long of Jefferson, Georgia, who had earlier attended "ether frolics," used this gas in March, 1842, when removing a small septic tumor from the neck of a patient. This was the first use of ether in surgery, but unfortunately Dr. Long did not publish the results of this and subsequent ether administrations until 1849, when there appeared his article entitled "An Account of the First Use of Sulphuric Ether by Inhalation as an Anesthetic in Surgical Operations." Dr. Long died unrecognized, unremembered, and unaware that posterity would eventually rightfully credit him as the first to use ether in surgery successfully.

The Hartford dentist, Horace Wells, once teacher and later partner of Dr. Morton, had used nitrous oxide successfully as a dental anesthetic in 1844, but when Dr. Wells attempted to demonstrate its use as a surgical anesthetic at the Harvard Medical School in December, 1844, he was signally unsuccessful and the demonstration

became a fiasco. Dr. Wells published a book in 1847, *A History of the Discovery of the Application of Nitrous Oxide Gas, Ether, and Other Vapours, to Surgical Operation*, but the reports of Dr. Morton's successful work had already appeared in print. Frustrated and discouraged, Dr. Wells committed suicide at the age of 33. His exitus was flamboyant and melodramatic, utilizing the incised radial artery after the precautionary inhalation of ether to lessen the pain of death.

Charles T. Jackson, preceptor of Dr. Morton at Harvard Medical School, staked his claim to immortality on the basis of having suggested to Dr. Morton, on Sept. 30, 1846, the use of ether to relieve pain when filling teeth. Dr. Jackson wrote a book of 134 pages, entitled *A Manual of Etherization, Concerning Directions for the Employment of Ether, Chloroform, and Other Anaesthetic Agents, by Inhalation, in Surgical Operation*, but it was not published until 1861. Dr. Jackson sacrificed his career, his money, and his mind in fruitless attempts to wrest credit from Dr. Morton and recognition from the world. On Aug. 28, 1880, at the age of 75, Dr. Jackson died—a pauper and insane—"hopelessly bereft of reason," the last seven years of his life having been spent in a mental institution.

Dr. Morton, who as an assistant had witnessed Dr. Wells's unsuccessful demonstration of nitrous oxide, asked permission of John C. Warren, professor of surgery at Harvard, to administer ether to one of his patients before operation. Dr. Warren agreed, and on the morning of Oct. 16, 1846, Dr. Morton applied the ether vapor to the patient's mouth "for about three minutes, at the end of which time he sank into a state of insensibility," as Dr. Warren later wrote. A tumor of the jaw was then successfully removed without pain, and at the end of the operation Dr. Warren uttered the words that have achieved immortality, "Gentlemen, this is no humbug."

The first account of this operation appeared on Nov. 18, 1846, in the *Boston Medical and Surgical Journal* and was entitled "Insensibility during Surgical Operations; Produced by Inhalation." It was written by Henry Jacob Bigelow, a surgeon at the Massachusetts General Hospital. J. Collins Warren's account of this same operation appeared in the December 9 issue of the same journal. By Dec. 15, 1846, ether was in use in Paris and three days later, in London.

Dr. Morton christened his preparation "Letheon" and under this name applied for a patent. In connection with this application, he published a pamphlet, actually a circular, which was printed almost weekly. It was originally, as first issued on Nov. 26, 1846, a "mere letter of advice." In succeeding issues, "Letheon" grew by the inclusion of reprints of laudatory letters and newspaper comments from the entire country. In 1847 Dr. Morton published a 44 page pamphlet that included a description of his original apparatus. In writing this pamphlet "Remarks on the Proper Mode of Administering Sulphuric Ether by Inhalation," Dr. Morton had finally given his anesthetic compound its chemical name. The pamphlet itself dealt largely with general instructions concerning the use of ether.

Unquestioned recognition was not conveyed upon Dr. Morton in his lifetime. His energies and monies were consumed in a futile quest for unequivocal acknowledgment as the discoverer of surgical anesthesia, and his final days were spent in poverty. Dr. Morton died in Central Park in New York City as a result of apoplexy said to

have been induced by a publication in behalf of Dr. Jackson, which attempted to prejudice a subscription for financial aid then being arranged for Dr. Morton in New York City. Dr. Morton died in his forty-ninth year on July 15, 1868.

THE FIRST SIGNIFICANT SURGICAL CONTRIBUTIONS

We must at this point, the mid-nineteenth century, pause for a moment to clarify and more clearly delineate the standards by which the author determines what writings are germane to this brief history. Medical literature might most simply be defined as encompassing all written material pertaining to medicine, but in the modern period, with the rapid expansion of scientific and technological knowledge and the tremendous increase in both number and kind of communication media, we are being virtually inundated with medical writings. It would be impossible, even were it desirable, to include all such material. At best it would serve no purpose except to provide one more bibliographical tool. Thus we must arbitrarily limit our standards of inclusion to two major categories; first, those works that by virtue of their originality and unusual literary merit have become classics in their field, and second, those articles that detail contributions of unusual medical importance.

The application of similar standards to our earlier American medical literature would have eliminated much that is either of historical importance or of particular interest in developing the panorama of our medical literary heritage. And as the output of the earlier centuries was much smaller in quantity and probably less familiar to modern readers, it was felt only proper to give a greater proportionate representation to the embryonic stages of this particular evolution.

The nineteenth century was to witness the beginnings of significant American contributions in surgery leading to our present pre-eminence in this field. While the discovery of ether and ensuing controversy were occupying the attention of the East, two men, one in the Midwest and one in the South, were building reputations that would soon establish them among the "greats" in American surgery. Although their practices were not in the narrow sense strictly surgical, as specialization had not yet become commonplace, their major contributions were in this field.

The first of these men was Samuel David Gross (1808–1884), described by Garrison as "the greatest American surgeon of his time." The other was the South Carolinian, James Marion Sims (1803–1883), one of the most inventive surgical geniuses in American medical history.

In 1839 Dr. Gross published his *Elements of Pathology and Anatomy*. This extensive treatise, praised by Virchow, was based on Gross's dissections as well as on the knowledge gained "from numerous visits to the pork and slaughter houses of Cincinnati," and was the first comprehensive work of its kind in America. During the Civil War, Dr. Gross wrote a *Manual of Military Surgery, or Hints on the Emergencies of Field, Camp and Hospital Practice*, a sort of vade mecum, which served in large measure as a text for the surgeons of the North.

Although Dr. Gross had an extensive personal bibliography covering the entire field of medicine, he favored surgical, pathological, and historical texts. Continuing in the fine tradition of James Thacher's *Medical Bibliography*, Dr. Gross published his

Eminent American Physicians in 1861. He also wrote individual biographies of many physicians including Drs. Mott, McDowell, and Drake. On the occasion of the hundredth anniversary of medicine in America, Dr. Gross wrote an important and authoritative monograph on the development of American surgery, which is today still consulted by historians. At his death in 1884, Dr. Gross's autobiography still remained in manuscript form; it was published by his sons in 1887.

Unlike the enthusiastic Gross, James Marion Sims would have preferred a business career. He drifted half-heartedly into medicine in preference to either law or the ministry. He particularly detested "investigating the organs of the female pelvis," but despite this aversion, Dr. Sims became a world-famous surgeon and the greatest gynecologist of his time. While using rectal manipulation in attempting to correct a uterine displacement, he discovered the value of the lateral reclining position, now known as Sims's position. Later, in examining his patients with vesicovaginal fistulas, he found that using the knee-chest position, air would expand the vagina. By using a bent pewter spoon, he "saw everything as no man had ever seen it before." Then one day, while walking through his yard on the way to his office, he absent-mindedly picked up a piece of brass wire (then commonly used in suspenders) and got the idea for a silver wire suture for asepsis ("Silver Sutures in Surgery," 1858). After three years of experience with his operation for vesicovaginal fistula, Dr. Sims made known his surgical technique in 1852 ("On the Treatment of Vesico-Vaginal Fistula," *American Journal of Medical Sciences*). In 1861 Dr. Sims published a paper on "Amputation of the Cervix Uteri" (*Transactions of the Medical Society of New York*). He also published important papers on vaginismus (1861), cholecystotomy (1878), and the careful aseptic invasion of the abdominal cavity (1881).

THE CIVIL WAR PERIOD

The outbreak of hostilities between the North and the South and the consequent disruption of many peacetime activities also prevented the circulation of medical journals and publications to the South. During the War between the States, the South for all practical purposes was estranged from the rest of the world by military containment on land and an embargo by sea. Because of the corresponding embargo on medical literature, the South had to do without or produce its own. To this latter end the Confederate States Surgeon-General Stout authorized the publication of the *Confederate States Medical Journal*. This journal was printed at Richmond, Virginia, between January, 1864, and March, 1865; it is almost unprocurable today. To provide a surgical text for the Confederate surgeon, J. Julian Chisholm wrote and published *A Manual of Military Surgery* (1861). This book covered the duties of a camp surgeon, treatment of gunshot wounds, hemorrhage, and nervous shock, and "the purification of hospitals." Another important book printed in the South during the war was Joseph Jones's three volume *Medical and Surgical Memoirs*, which was consulted for many years as a source of statistics for the morbidity and mortality of the Southern armies.

Jonathan Letterman's *Medical Recollections of the Army of the Potomac*, in which was outlined the original plan for the organization of the U. S. Army Ambulance Corps,

was a Northern contribution of significance. Last, and in the opinion of Sigerist "the first comprehensive American medical book," was the full medical story of the Civil War, issued between 1870–1883, and entitled *Medical and Surgical History of the War of the Rebellion*.

THE POSTWAR DECADES

European medicine continued in its ascendency during the second half of the nineteenth century, and American medicine was rapidly coming of age. The American patient, objecting to prolonged medical management, lent himself to surgical treatment, and the technical skill of American surgeons, combined with their scientific daring and inventiveness, forged progressively more important links in the chain of surgical advances and innovations.

John Stough Bobbs (1808–1870) was the first to remove gall stones at operation ("Case of Lithotomy of the Gall Bladder," *Transactions of the Indiana State Medical Society*, 1868). The first important paper on appendicitis appeared in 1886 ("Perforating Inflammation of the Vermiform Appendix," *Transactions of the Association of American Physicians*), the work of another American surgeon, Reginald Heber Fitz. Three years later, Charles McBurney (1845–1913) published his classic paper on the diagnosis and surgery of appendicitis ("Experience with Early Operative Interference in Cases of Disease of the Vermiform Appendix," *New York Medical Journal*). McBurney's point is described in this paper.

America was also producing physicians of stature in other fields. One of the more prominent of these was Silas Weir Mitchell (1829–1914). As a young man Dr. Mitchell had sent a small selection of his poetry to Oliver Wendell Holmes for criticism and Dr. Holmes advised him to forget poetry and concentrate on medicine. Mitchell took Dr. Holmes's advice and went on to become an outstanding neurologist. But Dr. Mitchell never forgot his first love and in his middle age he had published many short stories, seven books of poems, 19 novels, and one biography.

"Between 1851 and 1863 Mitchell published 22 works which presented important [medical] findings," but probably his most significant work in this period was a study on snake venom ("Researches Upon the Venoms of Poisonous Serpents," 1860). During the Civil War Dr. Mitchell became chief of a military hospital for nervous diseases, and in 1864 he published his observations on "Gunshot Wounds and Other Injuries of Nerves." In this work can be found the earliest recognizable descriptions of ascending neuritis, the psychology of the amputee, etc. In 1875, in "On Rest in the Treatment of Nervous Disease," he introduced the "rest cure" or "Weir Mitchell treatment." In 1877 he published his classic monograph summing up these ideas, "Fat and Blood: and How to Make Them." His was the first book on this subject, and the method of treatment was adopted for use throughout the world, the book being translated into many languages. Dr. Mitchell had many other "firsts," including the first descriptions of causalgia (1864), erythromelalgia (1878), and postparaplegic chorea (1874). In all, Dr. Mitchell authored the impressive total of nine medical books and more than 100 medical articles. In literature, Garrison ranks him "near Goldsmith and Holmes, not far below Scott and Lamb." Sir Lauder

Brunton called Dr. Mitchell "the most accomplished and versatile physician of his time."

There were other important contributions of medicine, as opposed to surgery, in this era. In 1872 George Huntington (1850–1916) published his noteworthy paper "On Chorea" (*Medical and Surgical Reporter*). In 1862 Austin Flint (1812–1886), illustrious father of an illustrious line, described the heart murmur now bearing his name ("On Cardiac Murmurs," *American Journal of the Medical Sciences*). In the same year and in the same journal appeared Dr. Flint's observations on the excretory functions of the liver ("Experimental Researches into a New Excretory Function of the Liver"). And in passing, one must not overlook the brilliant contribution of William Wood Gerhard (1809–1872) in differentiating typhus from typhoid fever (*American Journal of the Medical Sciences*, 1837).

THE RISE OF MEDICAL BIBLIOGRAPHY

In this period America claims two giants in the field of medical bibliography and history—Billings and Osler. Between them they developed our great repositories of medical literature and medical history and stimulated a widespread interest in these subjects.

Just as the library is the keystone in the arch of the university, the medical library is the cornerstone of the medical institution. Before John Shaw Billings (1838–1913) there were no medical libraries in this country worthy of the name. He created the Medical Library of the Surgeon-General's Office and his catalogue of its contents was a work of monumental importance. In 1864 there were but 1365 items in the library of the Surgeon General, and it was obvious to the industrious Dr. Billings that this shameful condition should not be permitted to continue. He therefore proceeded to enlarge the library's holdings by obtaining, largely through his personal dynamism and charm, medical items, including many rarities, from various librarians and individual collectors. By 1872 the short title list included 13,300 volumes, and by 1878 there were approximately 400,000 subject cards. In 1878 he applied to the Congress for an appropriation better to continue his task. The appropriation was granted, and in 1880 appeared the first volume of the *Index Catalogue of the Library of the Surgeon General's Office, U. S. Army*. When completed, this was the most exhaustive and valuable medical bibliography ever published. In this truly magnificent compilation, for the first time, authors and subjects were included in one alphabet, as were titles of books and periodicals of all times. It was by far the closest thing to a complete index of medical knowledge and had a remarkable degree of accuracy. The first series, of 16 volumes, was completed in 1895, the year Dr. Billings retired from the Surgeon General's office. William Welch was not unduly generous when he described the *Index Catalogue* as "one of the four greatest contributions that the U. S. had made to the science of medicine, unique in scope and technique of citation." The creation of this prodigious work gave a tremendous impetus to the development of American medical libraries, which today outrank their European counterparts in number and scientific value.

Dr. Billings was also a prolific writer, accounting for approximately 200 titles

including perhaps the best history of surgery in English, appearing in *Dennis' System of Surgery*, 1895, and the most searching account of American medical literature, written in 1876 in commemoration of American medicine's centennial celebration.

The genius of William Osler defies accurate description or pin-pointing. He was neither a great medical scientist, nor the most profound medical historian, nor the greatest medical bibliographer; and yet in large measure he was all of these and something more. Garrison described him as "the greatest physician of our time," and he might well be considered the great teacher and inspiration of the English-speaking medical world. His achievements were both practical and spiritual, contemporary and everlasting.

Dr. Osler was invited to the then newly erected Johns Hopkins Hospital in 1889 as professor of medicine, and in 1891 he began writing his *Principles and Practices of Medicine*, which was completed and published in 1892. This book was the best and most widely used medical text of the times, and it is consulted even today. As a clinician, Dr. Osler was without peer and his medical contributions were catholic in range and far-reaching in significance. He was among the first to describe hereditary telangiectasia; his article "On a Family Form of Recurring Epistaxis, associated with multiple telangiectases of the skin and mucous membranes" was printed in the *Bulletin of the Johns Hopkins Hospital* in 1901. In his Gulstonian Lecture on malignant endocarditis (*British Medical Journal*, 1885) was the first mention of subacute bacterial endocarditis; in 1908–1909 he described the tender subcutaneous nodes (which he first noted in 1888) frequently found in this disease. These nodes now bear his name. The article including the description of these nodes ("Chronic Infectious Endocarditis," *Quarterly Journal of Medicine*, Oxford) also constitutes the first definite clinical description of the disease entity.

Dr. Osler was an avid collector of medical rarities and classics. His invaluable library of approximately 7500 items was bequeathed to McGill University, his alma mater. Dr. Osler devoted much time to bibliography in his later years and had almost finished the "Bibliotheca Prima" of his *Bibliotheca Osleriana* when he died in 1919. This vast work was completed by his nephew, W. W. Frances, and was published in 1929. It was Dr. Osler's principal legacy to medical bibliography and undoubtedly the most interestingly annotated medical catalogue of all time. The catalogue, which was outlined by Dr. Osler before his death, was divided into eight sections with the items being arranged chronologically in each section. The headings were "Bibliotheca Prima," "Secunda," "Litteraria," "Historica," "Biographica," "Bibliographica," "Incunabula," and "Manuscripts." Dr. Osler's style was lucid yet flowing, and a fascination to read, his erudition exhaustive and his inspirational quality supreme. He was truly the "whole" physician.

THE PIONEERS

One of the greatest surgeons of the nineteenth century became professor of surgery at Johns Hopkins in 1890. He was William Stewart Halsted (1852–1929). In working on the problem of conduction or block anesthesia, Dr. Halsted discovered the principle of infiltration anesthesia, publishing the results of his experiments in 1885

("Practical Comments on the Use and Abuse of Cocaine," *New York Medical Journal*). Dr. Halsted was a pioneer in surgical technique, being the first to use rubber gloves in surgery (1890). His successful introduction of many original and radical surgical procedures is detailed in articles on such subjects as: The first successful ligation of the subclavian artery in its first portion (1892); the use of a circular suture of the intestines (1887); a radical cure of inguinal hernia (1889 and 1893). Dr. Halsted published a number of articles from 1890 to 1898 describing his outstanding surgical contributions to the treatment of cancer of the breast. In a memorial address concerned with Dr. Halsted, Matas said of him that "in every advance that has marked the progress of surgery in the last 30 years, we find the impress of his hand and the reflex of his brain," a fitting tribute to a truly great surgeon.

The inscription on a tomb in Arlington National Cemetery, "He gave to man control over that dreadful scourge—Yellow Fever," succinctly sums up Walter Reed's priceless contribution to mankind. The first definite proof that yellow fever was transmitted to man by the *Aedes stegomyia aegypti* appeared in an article entitled "The Etiology of Yellow Fever" (*Philadelphia Medical Journal*, 1900). The conclusions contained in the article were a result of the heroic work performed by a four man Yellow Fever Commission sent by the United States Government to investigate an epidemic among American troops in Cuba in 1900. Walter Reed headed this Commission, which included Drs. James Carroll, Jesse W. Lazear, and Aristide Agramonte. (Jesse Lazear sacrificed his life in this battle against disease as a result of being accidentally bitten by an infected mosquito.) In 1901, in "Experimental Yellow Fever" (*Transactions of the Association of American Physicians*), the surviving members of the team presented their proof that the parasite of yellow fever was a filterable virus. As a result of this work, yellow fever was eradicated in the West Indies and the United States, if not the entire world.

THE LITERATURE OF MEDICAL HISTORY

The limitations of space do not permit a complete evaluation of contemporary medical literature. Therefore, the only contemporary medical writings that will be detailed are part of that literature that pertains specifically to the field of medical history.

Historical research, inquiry, and evaluation have always been considered subjects of serious study, engaging the efforts of noted scholars and being accorded respect and attention by the educated and professional man. But the specific history of medicine has been a peculiarly ignored and unexplored field. A resurgence of interest in the historical aspects of medicine appeared in Europe in the nineteenth century. This subject was pursued most energetically in the German-speaking countries, which produced such noted historians as Baas, Puschmann, Neuburger, Pagel, and the great Sudhoff.

There was no real interest in medical history in this country until Dr. Osler and William Henry Welch, with their characteristic intellectual vigor and enthusiasm-introduced this subject to their students at Johns Hopkins in 1890. A few medical, historical societies had been founded by the end of the first decade of the present

century, notably the Society of Medical History, also started in 1890 by Drs. Osler, Welch, and several others at Johns Hopkins. At the monthly meetings of this society, papers on various historical topics were read by the members. In this same period was organized the Chicago Society of Medical History whose *Bulletin*, first appearing in 1911, has been an unfailing reservoir of historical information. A *Medical Library and Historical Journal* was published in Brooklyn and New York from 1903–1907, and because the title was thought unwieldy, it was succeeded by the *Aesculapian*, even less long-lived, 1908–1909.

The primary impetus to a more widespread interest on the part of the American physicians in the history of their profession was supplied in 1913 when Fielding Garrison's *Introduction to the History of Medicine* first appeared. Although modestly entitled an *Introduction*, Dr. Garrison's book, written in superb prose by a master historian, was in reality an extensive, remarkably accurate, and detailed work covering the entire history of medicine. It is probably the best-written and most comprehensive work of its kind in the world today and forms the bibliographical basis for almost any present-day endeavor in this field. Dr. Garrison was a prolific writer of historical papers covering a wide range of medical subjects. His *Medical Bibliography —A Checklist of Texts Illustrating the History of the Medical Sciences* is an invaluable compilation of medical classics and is indispensable to anyone involved in study of the history of medicine. Dr. Garrison also continued and completed the task started by Dr. Billings on the *Index Catalogue of the Surgeon General's Office*.

The appearance in 1917 of *The Annals of Medical History*, edited by Francis R. Packard, represented a noteworthy landmark in the development of American medical-historical literature. Issued quarterly or bimonthly, the *Annals*, until its termination in 1942, contained a wealth of scholarly and original essays by many of our great medical historians. Dr. Packard was also the author of an excellent two volume *History of Medicine in the United States* (1901, revised 1931). His book is an authoritative narration of most that is important in United States medical history.

The more lively *Medical Life*, the first American medical-historical journal to be published on a regular monthly basis, was founded in 1920 by Victor Robinson. Dr. Robinson authored a number of well-written and more "popular" books on medical history, of which his *Story of Medicine* is probably the most readable, while still scholarly, account of this subject in existence.

Harvey Cushing, perhaps the greatest surgical figure of the century thus far and undoubtedly the outstanding neurological surgeon, was, in addition, a bibliophile and essayist. His *Life of Sir William Osler* (1925) is one of our most outstanding medical bibliographies. In 1946, John Fulton, the eminent historian and physiologist, wrote a biography of Dr. Cushing that merits equal rank with Dr. Cushing's *Life of Osler*.

The American Association of the History of Medicine, although founded as early as 1924, was fairly quiescent until the entire field of medical history was given "a shot in the arm" by the formation in 1930 of the Institute of Medical History at Johns Hopkins. When Dr. Welch, its first director, resigned his professorship at the Institute in 1932, his position was taken by Henry E. Sigerist, masterful pupil of the masterly historian, Sudhoff. Under Dr. Sigerist's exceedingly able and erudite

leadership, the Institute soon became the flourishing center of medical historical activity in this country. Dr. Sigerist founded the *Bulletin of the History of Medicine*, which, in 1939, was adopted as the official organ of the American Association of the History of Medicine, a function it has continued to serve with increasing prominence to this date. In 1947 Dr. Sigerist resigned from the Institute to devote his time fully to the writing of his *History of Medicine*, a monumental task envisioned by Dr. Sigerist to require eight volumes. At Dr. Sigerist's untimely death in 1957, only the first volume was in print (1951).

Mention must be made of the two learned and stimulating publications founded by Harvard University's most eminent professor of the history of science, George Sarton. *Isis*, first issued in 1912, was international in scope and concerned with the history of science. *Osiris*, appearing first in 1936, used as its broader base the history and philosophy of culture as well as science. Dr. Sarton is the author of the truly awe-inspiring *Introduction to the History of Science*. His use of the word "introduction" is at least as modest as was Dr. Garrison's. Three volumes have been published to date, the first appearing in 1937, and Dr. Sarton had reached only the end of the fourteenth century. The volumes of this work already published have commanded world-wide respect and admiration.

The number and caliber of American medical historians continues to increase. Such men as John Fulton, Chauncey D. Leake, Logan Clendening, Jean Curran, William S. Middleton, Owsei Temkin, Richard Shryock, Emerson Crosby Kelly, Ralph Major, to name but a few, by the character of their writings have established America's position as a major contributing source to the literature of medical history.

The Journal of the History of Medicine and Allied Sciences, which made its debut under the editorship of George Rosen in 1946, is our newest entry in the field of medical-historical journalism and has proved a valuable addition.

It should now be obvious that no paper of this modest ambition can adequately encompass the wealth of medical writings pouring forth in this era. Just as no physician today can be expertly conversant in every branch of medicine, so no detailer of medical literature can reasonably be expected to cover all that is produced. If this modest effort can but serve as an introduction to an introduction and perhaps stimulate in the reader a new or further interest in the literary history of his profession, then it will have performed a far more important service than the brief narrating of these medicoliterary events.

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SYMPOSIUM ON MEDICINE AND WRITING

The Symposium on Medicine and Writing that appeared in the November 1956 issue of International Record of Medicine has been published as a Monograph. The articles included in this Monograph are: "The Editing of a Modern Medical Textbook" by Russell L. Cecil; "Plain Talk and Clear Writing" by Morris Fishbein; "The Principles of Bibliographic Citation" by John F. Fulton; "The Art of Communication" by Joseph Garland; "On Writing a History of Medicine" by Douglas Guthrie; and "Minerva and Aesculapius: The Physician as Writer" by Félix Martí-Ibáñez

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The Evolution of Medical Research in the United States

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Medical research in the United States has achieved a status unique in its history. As Dr. James A. Shannon, director of the National Institutes of Health, said recently, ". . . medical research is supported today beyond all expectation of a few years ago; medical training has funds available that heretofore would have been judged to be impossible of attainment; and now money is becoming available in increasing amounts for the construction of new research facilities." Added weight is given to these remarks by notation of the fact that "the dollar volume of support for medical research in this country has increased from some $40 million to some $240 million over the past 15 years." To make these figures even more significant it would be desirable to indicate all the organizations (academic, governmental, industrial, and other) that either conduct medical research or give financial support to it or do both, together with the number of persons engaged in research. Such a list would exceed the bounds of this brief sketch, and so the reader must be referred to *Medical Research: A Midcentury Survey*, prepared by the American Foundation,[1] for additional data.

By way of contrast to the present picture, let us glance backward to a little more than a century ago. In 1840 Samuel Jackson, a well-known physician of Philadelphia, addressed the graduating class of medical students at the University of Pennsylvania. He used the occasion to deplore publicly the lack of medical research in America. After calling attention to the work of such outstanding German investigators as Johannes Müller and Jacob Henle, Jackson cried out: "Not one man is now conducting similar studies in the United States."

The difference between present conditions and those of earlier days is in fact startling, and it is therefore of some interest to outline very briefly the evolution of medical research in this country from its beginnings until the present day. Now it it must first be pointed out that the history of medical research is not synonymous with the history of medicine. Nevertheless, it is a significant segment of that history and, in fact, it constitutes one of the key factors that serve to explain it. To appreciate this fact it is necessary to digress for a moment to discuss the meaning of the term "research." Research is not an easy word to define. It has become so popular that it has become vulgarized. Thus the activity of a school boy in assembling material for a term paper or even looking up a word in a dictionary is often called research, and those who tabulate consumer preference for the wrappings of toilet soap or the colors of motor cars are called "researchers."

One can even assert that the routine counting of blood cells, reading of an electrocardiogram, or culturing of a stool specimen is not research, although these operations are often associated with the activity that we call research. But having sug-

gested what research is not—what, in fact, is it? For the purposes of this essay I have found it convenient to adopt the usage of Shryock. "Research," he wrote (implying medical research), "means a more or less systematic investigation of phenomena intended to add to the sum total of verifiable knowledge." This definition has certain connotations that must be noted. It implies more than the satisfaction of idle curiosity. In fact, it suggests a form of organized activity with a tradition that is both inheritable from the past and transmissible to the future. Thus research is an activity that has become both professionalized and institutionalized and as such is a subject of historical inquiry.

Curiously, however, the history of research in general and of medical research in particular has still to find its historian. Merely to list chronologically all discoveries ever made will not suffice. Even a review of ideas entertained, sustained, or discarded will not tell the whole story, although such data are essential to it.

An adequate history of medical research would have to provide answers to many questions. Is medical research an activity that has always been associated with medicine? When did medical research actually have its origin? Who were its practitioners and what were their aims and motives? What were their problems and how did they select them? What techniques did they use—observational, experimental, instrumental, etc.? Where did they do their work, i.e., what is the history of the research laboratory itself? Were the research methods and instruments peculiar to medicine or were they borrowed from other sciences? What contributions did medicine make to science, and vice versa, and how did these contributions affect the growth and development of each? How were the early results of research recorded and in what form were they disseminated? What influence did the invention of writing, printing, and the consequent democratization of knowledge have on the progress of research? How were researchers trained and selected? Whence came their support and how were their investigations financed? How did the organization of learned societies and academies influence the conduct and direction of research? What part did schools, universities, libraries, and museums play? And what of the role of hospitals? What effect did the growth of geographical exploration and of commerce, trade, and industry have on research and the type of problem challenging the research worker? What influence have wars had on medical research? How and when was research transformed from a matter of satisfying personal curiosity to one of providing answers to problems of public interest? What has been the role of philanthropy (individual and corporate, i.e., foundations) in the stimulation and furtherance of research? What has been the role of government?

These are just some of the questions that a history of medical research might be expected to answer. They would apply to the subject in general or to the history of medical research in a specific country like ours. It can be seen at once, incidentally, that a large volume or perhaps several volumes might be required to contain the sort of history indicated by our questions.

The reader now is perhaps justified in asking: Why, if the history of research is so important, has no one written it? Hasn't anyone even thought of it? The answer is most certainly yes, some have at least thought of the problem.

Sixty-one years ago William H. Welch, one of the founding fathers of modern

American medical research delivered an address on "The Evolution of Modern Scientific Laboratories." The occasion was the opening of the William Pepper Laboratory of Clinical Medicine in Philadelphia on Dec. 4, 1894. In this address Dr. Welch pointed out that "the evolution of the modern laboratory still awaits its historian."

In 1946, Iago Galdston published an essay that opened with the provocative challenge: "Wanted—a history of research." Dr. Galdston indicated in more elaborate form the scope of such a history. Then, in 1947, there appeared a substantial monograph by Richard H. Shryock, now the director of the Institute of the History of Medicine at the Johns Hopkins University. His book, *American Medical Research, Past and Present*, is a most useful introduction to the history of this subject.

Nevertheless, the existence of Dr. Shryock's book does not mean that the plea of Dr. Welch and Dr. Galdston has been answered in a satisfactory fashion. The question still persists as to why it has taken so long for even one book on the history of medical research to appear. And the answer to this question, I suggest, is to be found in the history of research itself. It has been only recently, within the past four or five decades, that medical research has commanded the attention and occupied the place it does today.

It may be said, in fact, that medical research has come of age, and with this coming of age has come self-awareness. With self-awareness comes a recognition of the need for a history. When Dr. Welch suggested that it would be interesting for someone to write a history of the evolution of the scientific laboratory, medical research was still in its infancy. In fact, Dr. Welch himself was one of the major architects of research in the institutionalized and organized form in which we know it today. Yet it is one of the marks of his genius that in the midst of his activity as a maker of history, he foresaw the necessity to write history.

THE BEGINNINGS OF MEDICAL RESEARCH IN THE UNITED STATES

In 1876, in a survey of American medicine during the preceding century, Edward H. Clark, then professor of medicine at Harvard, wrote:

> In making up our estimate, however, let us remember that a large amount of scientific work cannot justly be expected of the medical profession in a new country. When the nation had acquired its independence, its population extended along a narrow coast-line from what was then known as Massachusetts, now Maine, to Georgia. The inhabitants had the Atlantic Ocean in front of them, and in their rear the unexplored forests, filled with aborigines that stretched far away towards the Pacific. As a matter of necessity they were obliged to occupy themselves almost exclusively with the task of obtaining a secure existence in a new country. For the first fifty years of the nation's life, the necessities of the present left little leisure for the cultivation of the arts and sciences. The medical profession were compelled by their position to devote themselves exclusively to the practice of their profession and to leave scientific investigation and discovery to a later period. There was no superabundance of educated physicians. If Boerhaave, Cullen, Hunter or Bichat had found themselves in America at that time they would have been obliged to take care of the sick, rather than investigate the laws of disease and of life, and the world would not have heard of them as original investigators and natural philosophers.

Now this interpretation is perhaps true in a limited sense. In masterly fashion, Shryock has shown that there were other factors besides the practical necessities of

establishing a new country that had a retarding influence on medical research. He wrote:

> There is some reason to doubt that a new country necessarily lags in science, once it possesses a certain minimum of population and wealth. This minimum was reached in several American provinces as far back as the later eighteenth century. Philadelphia was then the second largest and wealthiest English city, and New York, Boston and Charleston were not far behind. Work of international significance was done in both physics and biology by men in or from these centers. One need only recall the achievements of Franklin and of Count Rumford in physics or the biologic insight of Wells of Charleston, who anticipated Charles Darwin's theory of evolution by some fifty years. All those general social forces which made possible the "Enlightenment" and the advance of science in that era—commercial development, the rise of middle classes, the growth of towns and the consequent founding of academies and universities—expressed themselves in American cities as well as in European before 1800.
>
> Even those institutions most significant for medical research, the hospital and the medical school were available in New York and Philadelphia before the Revolution. So, too, were the professional facilities helpful to original investigation as well as to practice. Local and state medical societies were formed from 1760 on, and states were persuaded to recognize regular physicians by licensing regulations. By about 1810, journals and other publishing opportunities were expanding in a modest degree.

What was lacking was the "tradition of learning." The isolated investigators in medicine who did make major contributions were so few as to be almost the exceptions to prove the rule. Thus William Beaumont, America's first authentic physiologist, was an army surgeon at an isolated frontier post in northern Michigan when he began his studies on the physiology of digestion in his patient, Alexis St. Martin. For 12 years (1822–1834) he continued his investigations and published his classic book in 1833. Dr. Beaumont was encouraged and supported in his work by Joseph Lovell, surgeon general of the U. S. Army. With Dr. Lovell's retirement, however, things changed. His successor had no interest in or understanding of investigative work, and Dr. Beaumont left the army. Despite the fact that his work was recognized and acclaimed abroad and his results incorporated in textbooks, no university or medical school saw fit to call him to its faculty. Laboratories for men like Dr. Beaumont just did not exist. Thus, after leaving the army he settled in St. Louis where he became a successful practitioner of medicine. When he died at the age of 68 he left no school or successor. It was not until after the Civil War that any further significant work in physiology was done in this country.

Another worker was Daniel Drake who, in addition to being a teacher and founder of medical schools, was America's first medical geographer. Based on 30 years of travel and observation, Dr. Drake's massive work, *The Diseases of the Interior Valley of North America* (1850–1854), constitutes another lone classic of American medical research.

However, by this time, i.e., the middle of the nineteenth century, there were signs of an acceleration in the tempo of scientific advance.

In 1846 two important events occurred. In that year, ether anesthesia for the relief of surgical pain received its first public demonstration in the operating theater of the Massachusetts General Hospital in Boston. American surgery, which already had achieved considerable fame for brilliant and daring operations performed, now was enabled to move on to new frontiers. Nevertheless, the full fruits of this dis-

covery were not to be garnered until many years later when scientific laboratories and research institutes made possible the development of a science of anesthesiology.

The second important achievement of 1846 was that the United States Congress, after several years of discussion, at last accepted the gift and implemented the will of James Smithson, an Englishman, who was the illegitimate son of the Earl of Northumberland. Dr. Smithson was a scientist of considerable distinction in the field of mineralogy and was a Fellow of the Royal Society. In his will he left his entire fortune of more than $500,000 to this country and expressly stated: "I bequeath the whole of my property to the United States of America to found at Washington under the name of the Smithsonian Institution an establishment for the increase and diffusion of knowledge among men."

The significance of this event lay in the fact that, for the first time in this country, scientific research had a substantial endowment with emphasis on research and on the dissemination of the results of research. Under the leadership of Joseph Henry, its first secretary, and his successors, who were outstanding scientists of similar caliber, the new institution began to play a leading role in fostering scientific research in this country. Despite the fact that medicine was not a direct beneficiary under Dr. Smithson's will, the institution, by its work in general science, created a climate of opinion that ultimately did influence the advancement of medical research as well.

In 1861, the Civil War broke out and medicine in the United States went through an "agonizing reappraisal." A moribund Army Medical Department, which in 1860 was operating with 98 officers and an appropriation of only $90,000, was suddenly forced to cope with medical problems on a vast scale. The department was confronted with unprecedented numbers of battle casualties and camp diseases; an ambulance corps, field services, base hospitals, and provision for mass medical examinations had to be created literally from nothing. The chaotic conditions caused a public clamor that led to the creation of the U. S. Sanitary Commission. This commission brought about the appointment of William A. Hammond as surgeon general, and he was given a mandate to reorganize the Medical Department. This he did with remarkable speed, administrative skill, and energy. Among Dr. Hammond's innovations was the creation in 1862 of the Army Medical Museum, a unique institution in American medical history. Dr. Hammond, who himself had had some battlefield experience, was aware of the pitifully inadequate medical knowledge and training of the vast majority of physicians and surgeons who were being called to the colors. Educated mainly under the preceptorship system and having had relatively short courses of lectures and almost no hospital experience, most of these men were being called on to treat injuries and diseases they had rarely seen.

When Dr. Hammond took over the direction of the Medical Department, he conceived the idea of a medical museum, which was to become a repository for examples of disease and injury from the battlefields; such specimens were to be used for teaching purposes and for preserving the medical experience of the Civil War for future study. The materials collected for the museum served as the basis for the massive multivolumed *Medical and Surgical History of the War of the Rebellion*, which was completed in 1870. Its publication was received with the highest praise from medical

leaders in Europe. But the production of this history was not the only contribution of museum personnel to the advancement of medical science. In 1863, J. J. Woodward, of Philadelphia, a well-trained physician with scientific interests and aptitude who was serving with the army in the field, was called to Washington and assigned to duty at the Army Medical Museum. There he did important pioneering work in photomicrography, then in its infancy. Dr. Woodward started a laboratory for microscopy, anatomy, and pathology, and he corresponded with many European leaders, including Virchow. He was the first American to use aniline dyes, discovered by William Perkin in England in 1856, for histopathological studies. Dr. Woodward published his results in a leading journal, the *American Journal of the Medical Sciences*, in 1865, but his results were not followed up by others in this country, mainly because there were neither qualified men nor laboratories to do the kind of scientific work that was already being done at the Army Medical Museum. As a matter of fact, not only was there a dearth of laboratories for medical research, there were very few microscopes in all of the United States and the number of physicians who knew how to use them was even smaller. One incident may serve to highlight this condition. In 1869, the U. S. Department of Agriculture invited John Gamgee, a veterinarian from Great Britain, to come to Washington to study certain diseases of cattle. For his investigations he required a microscope, and since the Agriculture Department had no such instrument, one had to be borrowed for his use from the Army Medical Museum.

Thus the Army Medical Museum, from its inception, began to play a significant role in the development of medical research in this country. A whole galaxy of workers, including such men as John Shaw Billings, Walter Reed, James Carroll, and others about whom more will be said later, helped to give the museum a widespread reputation as a center of scientific research and for some years as the principal medical research institute of this country.

During three wars, the museum continued to function and expand its activities. In World War II, in recognition of changing functions, its name was changed to the Army Institute of Pathology. In 1949, when the act unifying the Armed Services was passed, the institute was redesignated the Armed Forces Institute of Pathology, with the medical museum as one of its four major departments.

Long associated with the museum was the Surgeon General's Library. In 1868, John Shaw Billings, then in the surgeon general's office, found $80,000 left over from Civil War Hospital Funds. He induced Surgeon General George K. Barnes to let him use this money for building up the library. The library was originally a collection of books assembled for the use of the surgeon general and his staff. Dr. Billings, it appeared, had larger ideas. While still a medical student, he had been struck by the fact that nowhere in this country was there a medical library sufficiently large and comprehensive to include under one roof all the significant literature of medicine. The absence of such a library was in itself one of the impediments to the advancement of medical research in this country. Thus it was that Dr. Billings took advantage of an unprecedented opportunity to build a library that would be the peer of any such collection abroad. He also recognized that the maximum usefulness of this library could be achieved only through an adequate index-catalogue.

He therefore began the preparation of such an index, which in the course of time provided for the medical profession a bibliographical tool and a research instrument of unsurpassed usefulness. The index was begun in 1880, and 58 volumes had appeared by 1950, at which time publication was discontinued. By that time, the tremendous expansion of scientific and medical research and the enormous flood of publications simply overwhelmed the capacity of the index-catalogue, and faster means had to be found to assist research workers to keep abreast of the literature. Among the methods now being seriously studied is the use of punched cards, and it is of interest to recall that the man who invented them was the same John Shaw Billings who created the index-catalogue. Dr. Billings has been described as probably the greatest medical officer our army has ever had, a judgment that continues to be enhanced with the passage of time. It was William H. Welch who perhaps better than anyone else described the significance of the Army Medical Library and its place in American medicine. Asked by Edgar Erskine Hume, former librarian of the library, to list some of the great American contributions to medical science, Dr. Welch replied:

> I have been asked on more than one occasion what have been the really great contributions of this country to medical knowledge. I have given this matter some thought and think that four should be named: 1. The discovery of anesthesia. 2. The discovery of insect transmission of disease. 3. The development of the modern public health laboratory, in all that the term implies. 4. The Army Medical Library and its Index Catalogue, and [he added slowly] this library and its catalogue are the most important of the four.

In 1956 the Army Medical Library, which for so many years had shed a proud luster on the Medical Department of the army was, by act of Congress redesignated the National Library of Medicine. This was what Dr. Billings had had in mind when he undertook to spend 80,000 dollars for the library.

The developments in Washington in the postbellum era did not, of course, in and by themselves usher in the age of scientific medicine. After the assassination of President Lincoln, Ford's Theater, scene of the tragedy, was closed and used by the Federal government for offices. Part of the space was assigned to the Army Medical Museum. Sightseers who came to Washington to see the spot where Lincoln was shot threaded their way between rows of museum jars and cases filled with specimens. The visitors stayed to look at these and soon the museum was a tourist's mecca (as it still is today).

It would be pleasant to report that the visitors to the Medical Museum were inspired by a curiosity that was scientific rather than morbid, but the fact is that the lay public and a large part of the medical profession had little understanding of the basic sciences such as anatomy, physiology, pathology, and chemistry and what they meant for the advancement of medical knowledge.

Medical schools in most instances were still proprietary. Thus they were in no position to ask for or receive public funds or endowments. With student fees as their only source of income, such schools could not support full-time professors or maintain scientific laboratories. The Anatomy Acts and the public aversion to autopsies made it difficult for such subjects as anatomy and pathology to be taught

in other than didactic fashion. Furthermore, most medical students were unprepared to benefit from laboratory courses, even if they had been available. Medical education was in fact a highly competitive business, and except for a high school diploma, the faculties required little more from their students in the way of preparation.

Yet already there were some signs of a change in the offing. In 1861, Samuel Gross of Philadelphia, one of the more progressive American teachers and surgeons, wrote:

> It requires no prophetic eye, no special foresight, to discover that we are on the very verge of one of the most fearful and wide-spread revolutions in medicine that the world has ever witnessed; another of those astounding changes whose name is already legion, and which, whether for good or evil is destined to convulse the profession, and to exert a most powerful influence upon the practice of the healing art.

The revolution to which Gross referred was, so far as this country was concerned, twofold. There was, first, the remarkable efflorescence of scientific activity in Europe, particularly in the basic sciences. It suffices only to mention the cell theory propounded by Schleiden and Schwann in 1839, the doctrine of cellular pathology by Virchow in 1858, and the proofs for the germ theory of disease, adduced by the labors of Pasteur, Koch, Cohn, Tyndall, and a host of others in the last third of the nineteenth century.

These developments stimulated increasing numbers of American students, especially medical students, to flock to Europe to sit at the feet of the masters and to learn about the new discoveries at first hand.

The other aspect of the impending revolution was the birth of modern university education in this country in about 1870.

In 1869 Harvard, under President Eliot, took a significant step by introducing electives into the curriculum. This forced a higher level of scholarship on the faculty as well as on students because of the emphasis on specialization. A further important step was the closer integration of the Harvard Medical School with the university and the appointment of Henry Pickering Bowditch as professor of physiology. Dr. Bowditch, who had studied under the great Carl Ludwig in Leipzig, established the first university laboratory of physiology in this country and began to train advanced students.

American colleges had for the most part been established to provide either a general education or training for the ministry. Whatever science was taught was on a relatively low level. Thus it was an event when Yale began to offer a Ph.D. degree in chemistry. In 1869 a course of premedical studies, the first in this country, was started in the Sheffield Scientific School at Yale. Among the first graduates of this course was T. Mitchell Prudden, who later became professor of pathology at the College of Physicians and Surgeons in New York City.

In New Haven was also established the first American laboratory for studies in physiological chemistry. Russell H. Chittenden was appointed director in 1874, while he was still an undergraduate. He then went to Germany to complete his training, and upon his return began to develop an active center of research in this

branch of chemistry. Many of the leading American chairs in physiological chemistry established in subsequent years were filled by Dr. Chittenden's students.

The year 1876 was a milestone, not only in the history of medical education in America, but in the history of medical research as well. In that year, the Johns Hopkins University was opened in Baltimore. Johns Hopkins, a merchant of that city, left his estate to found a university and stipulated that a medical school and hospital were to be associated with it. The university was the first to open its doors; the medical school and hospital began functioning a few years later. A brilliant faculty included such men as Newell Martin as first professor of physiology. Dr. Martin was a pupil of Sir Michael Foster of Cambridge, England, and his laboratory soon became an important center of research and training. Among his early students were George Miller Sternberg (later surgeon general of the army) and Walter Reed. These two brilliant army surgeons received their first induction into serious scientific research under Dr. Martin, later continued under William H. Welch. Thus the Army Medical Department was linked to the traditions of the new university.

Yet another link was forged when Daniel Coit Gilman, president of the Johns Hopkins University, called on John Shaw Billings of the Surgeon General's Library for advice on the construction of the new hospital and in the selection of a faculty for the medical school. Plans for the hospital were submitted by Dr. Billings and were accepted. His advice was also followed in the selection and appointment of William Henry Welch as first professor of pathology and of William Osler as professor of medicine. Thus, from his post in Washington, Dr. Billings exerted an influence on the course of American medical research and education that even to this day has not been adequately appreciated. In fact, it may perhaps be said with some justice that the greatest single thing that Dr. Billings did for the future of American medicine was selecting William Henry Welch for the chair of pathology at the Johns Hopkins University. It is not possible here to review in detail the life and work of Dr. Welch. This has been adequately done by Flexner, his biographer, and more recently by Fleming.

A few remarks, however, are pertinent. Dr. Welch came at a propitious moment in the history of American medicine. Seldom indeed were the man and the opportunity more happily matched. Born in 1850 in Connecticut, he studied at Yale and then took his medical degree in New York at Bellevue. He decided to complete his training by study in Europe, where scientific medical research was flourishing. There he was imbued with the scientific spirit, and when he returned, Dr. Welch was eager to carry on research. But no laboratories or opportunities comparable to those of Europe existed in New York or elsewhere. It was at this moment that Dr. Billings "put the finger on him," as it were, and Dr. Welch came to Baltimore. There he became, as Fleming described him, an "influential." Dr. Welch was in his time a phenomenon, and the explanation of him as such is that he came at a moment when two major currents, one social and economic, the other scientific, came into juxtaposition and through Dr. Welch were merged into one.

Fleming wrote:

> Few things in the history of the nineteenth and early twentieth centuries cast more light on human nature than the appearance of the "wealth problem"—not the money problem, but

> the wealth problem, how to spend excess money—among men now set free, beyond any previous conception of freedom, to make as much as they cared to make, substantially without restraint from church or state. The community no longer sat in judgment on private acts of public consequence. But some of the chief beneficiaries then turned around and rebuilt with their own hands walls between themselves and the attainment of their will, and in their own lifetime handed over their money to be spent for public ends by disinterested men. To have one's own way, direct and unexamined and unsanctified by the consent of others, left after all a void, and opened the way for philanthropies that made possible the revolution in medicine led by Welch.

This was then one stream; the other was scientific. With a few rare exceptions, as we have already noted, a scientific career for a medical man was almost inconceivable in this country. The public as a whole was not yet ready to support such persons, largely because no practical utility could be seen from scientific medical research. What was the value of an accurate knowledge of pathology if a disease could not be cured? In 1836, Dr. Gerhard of Philadelphia, who had studied under Louis, the great master of pathology in Paris, differentiated for the first time between typhus fever and typhoid fever: a great feat admittedly, but no comfort to a patient who wanted a cure, not a clinicopathological differentiation.

But in the 1870's a breakthrough developed. This was the revolution to which Gross referred in 1861. For (to quote from Fleming once more):

> The decisive break came in the 1870's and 1880's when Louis Pasteur, not a physician, Robert Koch, not a clinician, and Joseph Lister, the surgeon apostle of Pasteur, first began to loom up in the popular mind as representatives of a new type of scientific medicine—experimental, active, manipulating its data by main force, given to speak not of concomitants and symptoms but causes of disease, and crowned by success in prevention and treatment. What medical, natural history and the numerical method could not do, the germ theory of disease did: it gave the scientific man of medicine the prospect of general assent to his chosen way of life. The isolation and singularity of the medical research man in America and elsewhere was bound to grow less from this beginning; and it can scarcely have been altogether a coincidence that this was the moment when William H. Welch fixed upon a new kind of American career and opened the door on the future of American medicine.

It was William Osler, colleague of Dr. Welch at Johns Hopkins, who indirectly assisted in opening the door. In 1892, Dr. Osler published his *Textbook of Medicine*. This in itself was not a remarkable thing—many others had written or were writing texts on medicine. The unusual thing was that this book came into the hands of Frederick T. Gates, a Baptist clergyman who was the principal advisor to John D. Rockefeller on matters of philanthropy.

Gates, although he was a medical layman, found much food for thought in Dr. Osler's book. Despite its bulk, this work made very plain the highly significant fact that almost nothing was known about specific therapeutics—specific cures for specific diseases. Struck by this fact, Gates recognized that here was an opportunity for practical philanthropy. He therefore drafted a memorandum to the elder Rockefeller, pointing out what he had learned from Dr. Osler's book and recommending that consideration be given to the creation of an institute of medical research. In 1901 the first steps were taken by the formation of an advisory group to study the establishment of an independent medical research institute. L. Emmett Holt, Chris-

tian Herter, T. Mitchell Prudden, and Hermann M. Biggs were members of this board and William H. Welch was named chairman. From then on, things moved rapidly.

Plans for the new institute, to be known as the Rockefeller Institute for Medical Research, were completed in 1902, and the institute began functioning in 1904 in temporary quarters, with Simon Flexner, a pupil of Dr. Welch, as its first director. In 1906 the institute moved into its permanent home on the banks of the East River in New York City, a site it still occupies. A research hospital, the first of its kind in America, was added in 1910.

The new institute began to function slowly and almost tentatively. Despite the fact that there were in existence in Europe similar institutes, such as the Pasteur Institute in Paris, the Imperial Health Office in Berlin, still actively directed by Koch, and others, they did not provide a pattern suitable for the American scene. The European models, well equipped and endowed, were essentially built around a man and his personality.

A broader base was sought for and developed here. The European institutes, built around and reflecting the personalities of Pasteur, Koch, and Ehrlich, for instance, emphasized bacteriology and immunology. The Rockefeller Institute however, although giving full recognition to these fields, also included the broad areas of biology, physics, and chemistry within its purview. For it was already recognized by Dr. Welch and his colleagues and implemented by Dr. Flexner that the important medical advances of the future were to come from the fundamental and basic sciences on which the structure of medicine rests. Thus it was that among the early members of the scientific staff were such men as Meltzer, a physiologist, Levene, a chemist, Loeb, a biologist oriented toward physical chemistry, Van Slyke, a chemist with a flair for quantification, and Noguchi, a serologist and microbiologist. In 1910, further emphasizing the broad interests of the institute, a Division of Animal Pathology was created with Theobald Smith as head. Until 1933 Dr. Welch was the guiding genius in directing the scientific affairs of the new institute. In the very early days, one of his associates counseled him to advance slowly and cautiously for fear of "glutting the market" for medical researchers. Yet within a few years, other medical research institutes were being established elsewhere and demanding trained workers. In 1902 the Carnegie Institution was established, and again Dr. Welch was one of its directors.

In Chicago in 1902 the John McCormick Institute for Infectious Diseases was established, the Phipps Institute for Tuberculosis was begun in Philadelphia in 1903, and the same donor created the Phipps Psychiatric Clinic in Baltimore in 1913.

Dr. Welch, in the meantime, continued to promulgate the thesis that the real home of scientific research was the university. He wielded his vast influence therefore in this direction. He provided the stimulus for the endowment and creation of the Johns Hopkins School of Hygiene and Public Health, a model for many similar schools here and abroad. And finally, as a capstone to his career, and again with Rockefeller funds, he established the Institute for the History of Medicine at the Johns Hopkins University. When Dr. Welch died in 1934, medical research in America was well on the way to becoming the "big business" it is today.

These are only a few of the research establishments that began to transform the face of American medicine. Not only were institutes created, but an increasingly large share of the philanthropic dollar was contributed to the support of medical research. The Milbank Memorial Fund, the Rockefeller Foundation, the Josiah Macy Foundation, the Commonwealth Fund, and, more recently, the National Foundation for Infantile Paralysis, to mention but a few, are too well known to require discussion here.

The explosive development of these agencies and increased governmental interest in research give added emphasis to the central core of the philosophy of William H. Welch that, in the last analysis, the university and its laboratories and libraries are the real home, the seed bed of research.

These ideas were implemented through the famous report on medical education in this country prepared by Abraham Flexner for the Carnegie Institution. This report, by pointing out the defects in the organization of medical schools, especially those of a proprietary nature, forced a general house-cleaning. Many schools were closed, standards in the surviving institutions were raised, and new ones were endowed and established. Dr. Welch again played a large role in this development. Supporting the idea that the important chairs in medical schools should be occupied by men engaged in teaching and research and who were not dependent on medical practice for a livelihood, he helped to promote the full-time idea in medical education.

Last, a few words must be said about the Federal government and medical research. It has already been mentioned that the government very early began to have some interest in medical affairs. This interest was manifested through its obligations to care for the health of the army, navy, and merchant seamen. Its activities were purely practical, and medical investigative work was not considered a part of the government's business.

Thus it was that William Beaumont's excursion into physiology was a personal and private venture. Nevertheless, by the end of the Civil War, the government through the army began to play a larger role. The Army Medical Museum and the Surgeon General's Library provided an institutional basis for keeping alive the ideals of basic science and developing a tradition of research. Men like Drs. Woodward, Billings, Sternberg, and Reed were the ones who helped to create the record of achievement of the Medical Department of the army in the early days of this century.

Dr. Sternberg was a self-taught pioneer in the infant science of bacteriology. Independently of Pasteur and Frankel, he discovered and described the pneumococcus. When he became surgeon general of the army, he fostered research. In 1893 he established, within the walls of the Army Medical Museum, the Army Medical School, America's first school of preventive medicine and the prototype for the later schools, such as the School of Hygiene and Public Health in Baltimore, which we have already mentioned.

Now the research tradition incubated in the museum and library had a mechanism for perpetuating itself. In this new school, Walter Reed, curator of the Medical Museum and fresh from studies in physiology under Dr. Martin and in bacteriology and pathology under Dr. Welch, was named professor of bacteriology. Dr. Reed

helped to introduce the use of diphtheria antitoxin and urged government control of its preparation. When the Spanish American War broke out, Dr. Reed was a member of the commission to study typhoid fever. The report of this board was the first of a series of advances that culminated in the development of a practical method of vaccination against typhoid. Based on earlier European research, the vaccine developed in the Army Medical School by Major F. R. Russell (now brigadier general, ret.) coupled with effective sanitary measures had the effect of eliminating typhoid fever as an important military hazard by 1917.

The story of the conquest of yellow fever by Dr. Reed and his colleagues and of the application of these results by Dr. Gorgas, also of the army, to the construction of the Panama Canal is too well known to require repetition here.

The studies on hookworm disease by Bailey K. Ashford, one of the first graduates of the Army Medical School, led to the control of another great human scourge.

The close of the Spanish American War left this country with a minor empire in the tropics, which provided not merely responsibilities but opportunities as well. Thus the army and navy both began to carry on active programs of research in tropical and related diseases. In the Philippines, not only were infectious diseases like dengue fever and plague studied intensively by men like Siler, Strong, and Hitchens, but pioneering work on other maladies was done. Thus Vedder was among the early workers on nutritional disorders and deficiency diseases. All of these men were products of the Army Medical School, now continuing its work as the Walter Reed Army Institute of Research.

The navy also organized a medical school and began to do research. Early in the century, Lt. E. R. Stitt (later to become the Surgeon General of the Navy) was sent to England to study tropical diseases at the new London School of Tropical Medicine and Hygiene. Upon his return he established himself as a leading American expert in this field and wrote what became a standard American text on tropical medicine.

A third department of government that, from small beginnings, has played an increasing role in medical research is the United States Public Health Service. It began in 1798 as the Marine Hospital Service and, for most of its existence as this service, was concerned principally with providing medical care and hospitalization to merchant seamen at our principal ports.

In 1887 J. J. Kinyoun, an officer in the Marine Hospital Service, who had been abroad studying bacteriology in France and Germany, set up one of the first American bacteriological laboratories at the Marine Hospital on Staten Island, New York. Four years later this unofficial laboratory was given legal status by Congress and moved to Washington, where it was known as the Hygienic Laboratory. The new knowledge of the cause and control of infectious diseases was reflected in increased governmental interest in these matters. In 1902 the Marine Hospital Service was renamed the Public Health and Marine Hospital Service, and in 1912, its name became the United States Public Health Service.

There is no space here to recount the research record of the Hygienic Laboratory and its corps of devoted workers—men like Henry Rose Carter, who helped unravel the enigma of yellow fever, Edward Francis, who studied tularemia, and Joseph Gold-

berger, who contributed so much to our knowledge of pellagra. As a monument to them and a host of others, there has been erected the greatest of medical research centers known, the National Institutes of Health in Bethesda, Maryland, on the outskirts of Washington. Seven separate institutes, each devoted to the study of a disease or group of diseases, are now clustered around a great hospital.

The days when Americans who wished to complete their medical training, or to do research, had to travel to Europe to work in laboratories and receive instruction and inspiration have passed. The pendulum now swings toward the new world and from every land come medical and scientific pilgrims to seek new knowledge. A century ago, a medical research worker in America had no past or future. Today he has both.

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TREATMENT OF BENIGN PROSTATIC HYPERTROPHY. In a blind controlled study of 40 cases of diagnosed benign prostatic hypertrophy, the use of glycine-alanine-glutamic acid capsules (Prostall capsules, Metabolic Products Corp.) for a period of three months reduced the prostatic enlargement in 92 per cent, to normal size in 33 per cent (J. Maine M.A. 49: 99, March 1958). Nocturia was relieved in 95 per cent of cases, urgent urination in 81 per cent, frequency in 73 per cent, discomfort in 71 per cent, and delayed micturition in 70 per cent. No untoward effects were observed in any case.

TAY-SACHS DISEASE UNAFFECTED BY SPECIAL DIET. The disorder of cellular lipid metabolism that characterized Tay-Sachs disease was unaffected by a special dietary regimen, reported Marion Barclay (Sloan-Kettering Institute for Cancer Research, New York). Vegetable fats were substituted for animal fats in otherwise typical feedings given to two 4-month-old infants with Tay-Sachs disease and 2 normal controls. Studies of alpha and beta lipoproteins in diluted Tay-Sachs plasma showed some variations after four months of the diet, but the clinical course of the disease was unchanged.

CARDIOVASCULAR LESIONS PRODUCED EXPERIMENTALLY. For the first time myocardial infarcts and coronary occlusions have been produced experimentally in rats, reported George F. Wilgram (Banting and Best Medical Research Institute, University of Toronto). By giving growth hormone to choline-deficient rats, the usual cardiovascular lesions were considerably aggravated. Sixty-six per cent of the animals showed involvement of the coronary vessels, 35 per cent had coronary occlusion, and 15 per cent had myocardial infarctions. The lesions were probably secondary to severe bilateral renal cortical necrosis, which occurs first, said Dr. Wilgram.

STREPTOKINASE-STREPTODORNASE SPEEDS HEALING OF INJURIES. Successful use of streptokinase-streptodornase to reduce swelling and speed healing of injuries and infections was reported by the Veterans Administration. The drug was given in tablet form to 57 patients with conditions involving abscess, swelling, and blood clots. Some improvement in inflammation and swelling was observed within 24 hours after the drug was administered, and preventive use of the tablets

permits surgical repair of extensive wounds with only a fraction of the swelling that usually occurs.

MARFAN'S SYNDROME. Marfan's syndrome, a disorder characterized by ocular and cardiovascular abnormalities, symmetrical elongation of extremities, and fibrous contractions of fingers, toes, and knees, was recently described (Bull. Rheumat. Dis. 8:153, 1958). There was some form of musculoskeletal pain in 20 of 40 cases: e.g., 7 patients had pain in the lower part of the back; 4 patients had joint effusions. In a patient with stiffness of the cervical spine, differential diagnosis was required from rheumatoid arthritis.

DETECTION OF MALIGNANT MELANOMA OF THE RETINA. Malignant melanoma of the retina, whose symptoms closely resemble those of fluid detachment of the retina and retinal inflammation, can now be positively detected with a Geiger counter after injection of radioactive phosphorus, reported Jack Krohmer (Parkland Memorial Hospital, Dallas). Malignant melanomas of the retina register about a 40 per cent higher count than do the two benign conditions. This diagnostic procedure could conceivably save many eyes that might otherwise be removed for fear the symptoms indicated presence of a tumor.

COMPLICATIONS OF ASIATIC FLU. Four patients with central nervous system complications developing after infection with the Far Eastern strain of the influenza virus were reported recently (New York J. Med. 58:859, March 15, 1958). A diagnosis of encephalitis was made in 3 patients with mental confusion and other signs; they recovered rapidly from the complication. A 24 hour schizophrenic reaction occurred in 1 patient; 2 others had convulsive seizures but recovered rapidly.

PREGNANCY TAMPON TEST. A new fertility time test to determine the likelihood of a woman's becoming pregnant at any given time was described recently to the Sixth Annual Clinical Meeting of the American College of Obstetrics and Gynecology. A tampon to which a glucose-sensitive paper is attached is held against the cervix uteri for five minutes. If the paper turns green, coitus is likely to produce conception. If the paper remains pale yellow or turns very slightly green, the patient is biologically infertile at that time. The test was devised by Charles Birnberg, Brooklyn research worker, on his finding that secretions in the fallopian tubes and uterus contain glucose only at the time of ovulation. The glucose apparently nourishes the egg.

Psychosomatic Aspects of Frigidity and Impotence*

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Even though the American woman looks and acts as though she is capable of sexual gratification, many do not have orgasm during intercourse, and for some, coitus is often an extremely disgusting experience. Male impotence is almost as widespread. The general practitioner must be able to recognize and treat these distressing afflictions according to his ability. Frigidity and impotence have profound psychosocial implications, as evidenced by increasing extramarital promiscuity, our high divorce rate, broken homes, and subsequent neurotic children.

Frigidity refers to sexual coldness regardless of the cause. It is usually psychogenic and must be distinguished from dyspareunia and pseudofrigidity. Dyspareunia, or painful intercourse, includes vaginismus due to spasm of the vaginal muscles. The latter may occur without intercourse, as, for example, during a vaginal examination.

Women seldom mention their frigidity to the family physician, and if asked about it, usually state, "Everything is alright." Many frigid women live their whole lives thinking orgasm is an impossibility for them, and inasmuch as their sexual role requires no "potency" comparable to that of the man, they simulate pleasure responses to please and deceive the man.

There are four types of frigidity.[1] Some women think they are not supposed to feel sexual pleasure because they have been conditioned to the idea that sex is indecent; therefore they submit passively. In others, arousal is present but no orgasmic response occurs. Then there is the group of women in whom sexual response occurs only after clitoral stimulation. The last type is true frigidity, or the total incapacity for vaginal orgasm.

The vaginal and clitoral theories for evaluating frigidity and orgasm differ so much that discussion cannot be attempted without defining them. Most followers of Freud adhere to the vaginal theory of orgasm and label 75 per cent of American women frigid—a figure perfectly correct according to their definition. A disciple of Kinsey or a proponent of the clitoral theory would contend that less than 25 per cent of these same women are frigid.[2] This difference of opinion is confusing to many physicians as well as being disturbing to millions of American women. A barrage of lay articles, medical treatises, and public and private discussions have only compounded this confusion.

PSYCHODYNAMICS

The argument as to what constitutes true frigidity is limited to the adult woman, since both schools admit that the clitoris is the dominant sex organ of childhood

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and plays an important role in masturbation. Most analytically oriented psychiatrists believe that, as the result of faulty maturation, many women remain fixated at the clitoral level of development, where the little girl imagines that her "small penis" will grow and become active. In these women the transference of sensation from the clitoris to the vagina, which normally takes place during adulthood, does not occur, and as a result, the woman cannot accept the passive-receptive role; consequently, for unconscious reasons, vaginal frigidity ensues. Absence of vaginal orgasm may be due to other psychological reasons. For instance, the husband may represent a father-figure, and this usually activates the old incest taboo. There may be fear of punishment for violation of sexual prohibitions; there may be conflicting loves, that is, love of father as opposed to love of husband, love of self as contrasted to love of husband, and love of other women as opposed to love of men as represented by the husband. Unconscious resentments and hates with a wish for revenge on men, based on the castration complex, or a wish to avenge the mother for all the suffering she went through at the hands of the father may also lead to this type of frigidity.

There is no doubt that envy of men and the fear of damage to the genital organs play at least some part in the psychosexual maturation of every woman, and in many cases they are the dominating factors in the development of the psychopathology responsible for true frigidity.

Ellis[3] and others believe that orgasm is orgasm regardless of how it is achieved, whether it occurs by genital to genital contact or after extracoital practices. Even the late Dr. Kinsey, whose pioneering studies have contributed so much toward sexual enlightenment, denied the existence of vaginal orgasm during intercourse because the interior of the vagina has relatively few sensory nerves. Yet he admitted that more than 20 per cent of his volunteers resorted to a vaginal type of masturbation—a figure closely paralleling the number of women who have vaginal orgasm in the sex act. He and his co-workers determined this relative vaginal insensitivity by gently stroking the side walls of the vagina with a glass, metal, or cotton-tipped applicator. They found that the interior of the vagina was less sensitive than the labia to this type of stimulation—therefore, they concluded that vaginal orgasm was a "biological impossibility." What they overlooked was the fact that the muscles beneath the vaginal mucosa contain proprioceptive cells (genital corpuscles) that are stimulated by the friction produced during intercourse. Also, response elicited by the fully erect male organ cannot be compared to response to a cotton applicator, and there is a distinct difference between the emotional situation in intercourse and during gentle stroking of the interior of the vagina with a glass rod in the physician's office.

Kinsey's greatest error was his contention that most of the physical stimulation during intercourse in the woman comes from contact of the vagina, the outer edges of the lips of the vagina, and the clitoris with the pubic bone of the man during the sex act. Thus Kinsey implied that the vagina does not feel the penis inside of it. He also apparently elevated the hair, skin, and pubic bone of the man to sex organs. He obviously was not aware that various surgical operations such as removal of the clitoris and labia during vulvectomy do not alter sexual responses.[4] This observa-

tion would seem to confirm the fact that the vagina is the center of sexual activity in the female.

However, this does not rule out the important role of the clitoris in sexual foreplay and extracoital practices. Most psychiatrists agree that extracoital or mouth-genital sex practices are not perverse or deviant, provided they end in genital to genital contact. Only when one particular type of sex activity is practiced exclusively does it become a fetishism. Our sex laws and mores prevent many couples from mutually participating in so-called perverse sex practices precoitally because of shame and guilt. If these were eliminated, many women would respond vaginally after clitoral stimulation.

Women who are truly frigid, clitorally or vaginally, really have no problem—they do not know what they have missed. They seldom seek help unless there is marital discord or they have been made to feel guilty by lay "psychiatrists." Women capable of arousal but who do not have orgasmic responses constitute the largest group who seek help, and it is these women whom the general practitioner can help. They can be informed that they need not feel guilty or ashamed if their clitoris has to be stimulated first or if they can have only clitoral orgasm; that women who have vaginal orgasm also have clitoral sensations; and, finally, that they can take pride in choosing the type of orgasm they prefer and under what emotional circumstances.

Marmor[5] believes that the intensity and degree of orgasm vary with the amount of psychological excitation present and are not determined by the origin or location of the orgasmic response. For instance, mechanical manipulation of the clitoris is experienced as a limited reaction due to reflex stimulation of the orgasm center, believed to be in the sacral segment of the cord. Sexual repression due to guilt, shame, hostility, and anxiety over the sex act produces cortical inhibition and, therefore, inhibits the spinal reflex, resulting in total incapacity for any type of orgasm. When inhibitions are lessened, a clitoral orgasm usually follows prolonged stimulation of the external genitals. Love and affection produce cortical facilitation instead of inhibition, and this often results in the optimum type of sexual response —vaginal orgasm.

The subject of love is usually ignored in all medical discussions on frigidity. The physician must emphasize that proficiency in the sex act and real satisfaction are seldom achieved until the partners get to know and love each other. Sexual compatibility is based more on respect, gradually established confidence, and mutual interests—that is, real love, the spiritual merger of one personality with another—rather than physical attraction per se. Solomon[6] has made an attempt to understand the concept of "love" as utilized in clinical medicine. He described four types of love. The first is a primary narcissistic or one-dimensional type; here, love is self-love, the source of all other loves. Two-dimensional love involves unconscious projection of the self elsewhere and loving it there; for instance, in mother, child, brother, teacher, God. Three-dimensional love is love of one's ideal self; the sexual attraction is very strong and the individual sees everything that he or she would like to be in the beloved. This is commonly portrayed in movies and novels and is known as romantic love. This type of love is only temporary because the partners

quickly see that what they looked for in each other was an illusion. After the initial thrill of the honeymoon, the chill sets in. Four-dimensional love is mature love that strives toward an eventual ideal. The sexual response may be weak at first, but because both partners are willing to nurture each other in a long-time affectionate relationship, the sexual attraction increases with time. This type of love is based on the sacrifice that one personality makes for the other; it is rare in our society and is exemplified by the old married couple celebrating their golden wedding anniversary—sex may have been nonexistent for them for many years, but they are just as much in love with each other as when they first met. Briefly, sex may be defined as the passionate interest in another body. Love is the passionate interest in another personality. Like whisky and soda, both may be found together, yet each can be taken separately.

CLASSIFICATION

For purposes of simplicity, we have resolved true frigidity into two subdivisions: true frigidity founded on purely psychic mechanisms and true frigidity founded on psychophysical mechanisms.[7–9]

This classification excludes aplasias, hypoplasias, acquired organic lesions of the genitals, the consequences of destructive operations or accidents, incorrect techniques, sexual ignorance, and male impotence; these must be classified as pseudo-frigidity rather than true frigidity. Also excluded are the so-called facultative cases of frigidity, where an orgasm is possible only with certain men.

Included in the first group are women who use frigidity as an escape from their own inadequacies; aggressive spinsters, agitative female "champions," narcissistic women, and violent espousers of virginity—in these women no physical factor is present.

In the second group may be included the "gold-digger," the lesbian, the prostitute, and the nymphomaniac—in all there is a physical or "contact" factor added to the psychic disturbances. Many of these women marry, but they are seldom willing to assume any serious obligations of wifehood or motherhood. They "gad about," are interested in sports, like to travel alone, shop for expensive items, or aggressively pursue a career—all neglect the husband and avoid pregnancy as a nuisance.

In this same group, are the women who are always obsessively cleaning house in order to escape from sex activities and thus exclude the husband—they are always too tired. Some have many children, conceived with indifference and lack of pleasure, on whom they bestow considerable attention—the husband is always relegated to the background. This type is characterized by martyrdom, resignation, and suffering; nearly all have a myriad of complaints that are psychosomatic in origin.

Their attitudes during intercourse are those of revulsion, disgust, and the desire "to get it over with in a hurry." They may or may not have a clitoral orgasm, but seldom have a vaginal one.

DIAGNOSIS

The general practitioner who is unaware of psychological factors will search for various physical abnormalities to explain the frigidity. These are the size and

structure of the genitals, the accessibility of the clitoris, and the position of the uterus; he will look for inflammations, fissures, ulcerations, and injuries, and he may attribute the frigidity to whatever lesion he finds. He seldom realizes that these women are actually indulging in a psychological masquerade, using their symptoms as an excuse for failure to enjoy sexual intercourse. Nearly all my patients presented themselves with extraneous psychosomatic complaints—dysmenorrhea, pelvic pain, backache, menstrual migraine headaches, and a host of other symptoms—as alibis for their lack of sexual gratification. Some even had as many as two or more operations without relief of the original complaints. It is also astonishing how infrequently the psychosexual history is discussed by either the physician or the patient, even though many of the symptoms involving the sexual organs are treated. With psychosomatic orientation, the physician will intuitively single out those women who derive little or no sexual gratification and also those who are using physical symptoms as a pretext for consulting him.

How can a physician attempt to determine whether or not true frigidity is present? If a physical examination of both husband and wife reveals no structural reasons for frigidity, he may safely assume that emotional problems are present that interfere with adequate sexual response. One way of attempting to make a diagnosis is to question the husband concerning the wife's response to coitus. A physician may point out to the husband that there is only one matter in which the wife is completely helpless, namely, controlling the involuntary contractions of the pelvic and perineal muscles, which are felt at the deepest insertion of the penis at or near the end of the coital act. This is the sole criterion for determining the presence or absence of orgasm. A woman has absolutely no conscious control over the muscles involved in these involuntary contractions. The husband can usually discern these fine fibrillary contractions, which usually signify sexual satisfaction for the woman. Any attempt at simulation by the woman is impossible.

Another indication, although less reliable, is the absence of lubrication at the entrance of the vagina before and during coitus. Bergler and Kroger[10] have pointed out that this is only a presumptive sign of frigidity. Of course, the reverse is not true; frigidity may be present even though vaginal secretion is adequate, since a leukorrheal discharge can be mistaken for lubrication. It should be easy for a physician to diagnose pseudofrigidity, due to male impotence, lack of proper technique, coitus interruptus, and intracrural coitus. This information can be obtained by questioning both husband and wife.

PROPHYLACTIC TREATMENT

Physicians should assume the responsibility for proper sex education and adequate premarital advice. Parents should be taught more about sexual behavior to prevent infliction of psychic trauma on their offspring. After all, how can a woman be told all her life that sex is wicked, sinful, and taboo, and then be expected to enjoy sex just because the union has been morally and legally sanctioned?

The ideal arrangement would be for every prospective bride and groom to interview a physician, preferably the family physician, whom they know well. First

the woman should be seen and then the man; then, if necessary, they should be seen together. Mass instruction such as is given in some colleges is excellent, but for the practical preparation for marriage, nothing can be compared to a direct person-to-person conference in private about two weeks before the wedding.

Such a conference should involve three things—a physical examination, instruction in the art of sexual intercourse, and contraceptive advice for those without religious objections. The talk should be as informal as possible. The physician should inquire first about the woman's general health and then about her past history. Then he should find out her attitudes toward menstruation, marriage, and the sex act or childbearing. He must allay any fears the woman has concerning these matters by proper explanations. The physician can find out whether the girl was brought up to repress all matters pertaining to sex or whether the parents educated her in an enlightened manner. This information will usually lead to a discussion of the anatomy and physiology of the genitals. For instruction along these lines, it is necessary to produce illustrations or, better still, a model of the external and internal pelvic structures. All the organs are pointed out and the function of each one is described in simple language. Then a physical examination should be made.

The following recommendations may be offered to parents and educators:[11] (1) A secure home atmosphere, with love, affection, tolerance, and discipline for all the children, is essential. (2) The opposite sex should not be played up to the child—if the parents wanted a boy, the girl should not be processed into a "tomboy." (3) Difficulty in bearing the child (or any child) should not be related to the youngster. (4) Prudishness in matters of bathing, toilet-training, childhood masturbation, and exposure should not be fostered by rigid proscription of these. (5) The child should not see the parent of the opposite sex in the nude or witness excretory activities, as these may have a harmful effect. (6) If possible, children should sleep alone and should not observe or overhear parental coitus. (7) Unembarrassed and straightforward explanations of menstruation and sex should be made to the girl at puberty. (8) Education toward chastity should not be overdone. Men should not be represented as beasts to impressionable young girls.

MEDICAL THERAPY

An intact hymen can be ruptured or stretched under general anesthesia; an irritating vaginal discharge should be cleared up and a caruncle removed. For those who have experienced orgasm, testosterone or male hormone can be tried to stimulate sexual desire. Androgens produce engorgement of the clitoris and increase libidinous drives. However, at best, they constitute substitutive therapy, and with their use, there is always the danger of producing virilism.[12] Circumcision of the clitoris is valueless. Through the use of resistive exercises with the perineometer, Kegel[13] has been able to convert clitorally fixated women to vaginal responses.

SUPERFICIAL PSYCHOTHERAPY

Since true frigidity is primarily due to deep-seated psychological factors, one may

question the right of anyone but a psychiatrist to treat these women. However, pseudofrigidity can be helped considerably by an understanding and sympathetic physician who can use reassurance and re-education.

There are various types of pseudofrigidity. The most common are found in women who get discouraged over their failure to obtain gratification from early coital attempts. They can be aroused, but consciously or unconsciously they feel guilty and inferior. Since they have no idea of what they are missing, they are desperately in need of help. The family physician can help these women if he can discover the causative factor for their pseudofrigidity. Some of the causes are as follows: The atmosphere or environment may often produce insecurity—proximity of neighbors, living with parents, an open window or door—all result in self-consciousness. Poor personal habits such as too few baths, messiness, poor dental hygiene are other sources of conflict.

Easily corrected are coitus interruptus, ineptness on the part of the husband, and a real or imagined difference in size of the penis and vagina. Fear of pregnancy and lack of confidence in contraceptive devices are other causes of pseudofrigidity; these can be corrected by educational measures such as temperature records of ovulation. Postpartum frigidity[14] falls into this group; intercourse is associated with the cause of all pain, fatigue, anxiety, and loss of freedom.

HYPNOTHERAPY

The physician oriented in hypnotherapy can use hypnosis with gratifying results. Many completely frigid women respond dramatically to posthypnotic suggestion to have vaginal orgasm.[15] The exact nature of what the woman is to expect must be described in detail during the trance state. In some, no attempt was made to obtain insight into the factors responsible for the frigidity. Some of these patients were conditioned to have either a vaginal or a clitoral orgasm, and the patients were informed that they could take pride in deciding the type of orgasm they wished to have and that they could have clitoral responses without guilt.

Such a method is open to criticism because it involves only symptom-removal. But is not the bulk of drug therapy directed to relief of functional symptomatology per se? Objections can be circumvented by use of hypnoanalysis—psychodynamic techniques employed during the hypnotic state.[16–18] Hypnoanalysis is a rational procedure for true frigidity because the recovered material is replete with significant details, new personality patterns can be engrafted, symptom-removal by direct suggestion is not utilized, and the cures are relatively permanent. Hypnoanalysis and its associated phenomena of amnesia, age regression, revivification, free association, and posthypnotic suggestion are tremendous time-savers. Hypnoanalysis varies only in degree from psychoanalysis, since it utilizes many of the concepts of dynamic psychiatry, that is, interpretation of the transference relationship, free association, piecemeal disintegration of the patient's resistances, reintegration into consciousness (assimilation by the conscious part of the ego) of the repressed material, and, as the result of insight, dissolution of any dependency, and the redistribution of the psychological energies formerly exploited by the symptom complex. Although hypno-

analysis is more rapid than psychoanalysis, it has a disadvantage in that not all persons are good hypnotic subjects.

The family physician must know some of the fundamental concepts of dynamic psychiatry in order to recognize those patients who are using psychosomatic symptoms as a façade for underlying sexual difficulties. Even though he cannot use hypnoanalytical and psychoanalytical techniques, it would be valuable to familiarize himself with these, as well as with some of the unconscious conflicts responsible for true frigidity.

IMPOTENCE

A physical examination should always be made to rule out organic disease of the nervous system. More than 95 per cent of cases have a psychological basis, varying from lack of interest in sex, to inability to have or maintain an erection, to premature or retarded ejaculation, and to ejaculation without the subjective sensation of orgasm. Drugs and various procedures such as prostatic massage are valueless, as are anesthetic ointments to abolish sensitivity of the glans penis.

A superficial type of impotence is often associated with excitement and anxiety during the first few weeks of marriage. After the partners adjust to one another, the impotence disappears if no neurosis is present. Fear of impregnating the wife can be corrected by proper contraceptive advice. Another temporary form of impotence occurs during emotional or physical exhaustion, and it should be differentiated from impotence in the patient who uses fatigue as a rationalization to explain his impotence. There are also impotent men who still feel guilty about their early sexual curiosity and masturbation, usually because these habits were interdicted by too old-fashioned parents.

PSYCHODYNAMICS

The basic psychological mechanism is the deeply repressed wish not to give to the woman in spite of all conscious desires. This may be due to deep-seated hostility toward the wife (consciously the husband will be afraid to pierce or penetrate). He may regard sex as degrading and not wish to besmirch his wife, whom he equates with his mother. This type of man will be potent with women other than his wife.

Premature ejaculation of long duration is difficult to treat because it has its beginning during early psychosexual development. The sexuality of the boy infant is characterized by passivity of the phallus. Men who have never emerged from this level of sexual maturation, or those who have regressed to it, can never actively use the penis to penetrate.[19] This type of man is satisfied with fellatio or masturbation by the woman.

According to Bergler,[20] these men have a deeply repressed masochistic wish to be refused in order to show up the wicked mother. They counter this conflict with a defensive layer of pseudoaggression. Because they unconsciously identify the breast with the penis, sperm and urine with milk, and the vagina with the mouth, they spill the "milk" (spermatic fluid) before it reaches their "baby's mouth" (vagina). They then ease their conscience by reproaching themselves for their "cruelty in spoiling the woman's pleasure."

PSYCHOPHYSIOLOGY OF ORGASM IN THE MAN

There is an orgasmic spinal center in the sacral segment of the spinal cord. Discharge of tension in this orgasmic center can be achieved either at a reflex spinal level or by cortical stimulation. In the former case, discharge results from mechanical stimulation of the genital corpuscles of the glans penis, which eventually causes a rising tension in the spinal center until a reflex discharge occurs. In the latter case, the cortical stimulation is achieved through psychological stimuli occurring through supraspinal receptors. Erotic stimuli through any sensory intake organ can produce orgasm in many men in the absence of physical stimulation of the penis. Anxiety or tension due to nonsexual factors may often produce orgasm, probably through excessive cortical excitation affecting the spinal orgasmic center.

A combination of spinal and cortical mechanisms probably produces healthy ejaculation accompanied by orgasm. The various combinations of psychological stimuli, even in the complete absence of direct physical stimulation of the glans penis, result in excitation sufficient to produce erection but not orgasm. Orgasm will not result unless a certain amount of additional physical stimulation of the glans penis occurs through the friction during intercourse. The mounting excitement of the partner reinforces the physical excitation of the glans penis during the sex act. Ideally, but extremely rarely, the increment of excitement occurs simultaneously in both partners, and the interaction of physical and psychological stimuli finally results in ejaculation with orgasm.

TREATMENT

The majority of severely disturbed persons, especially those whose impotence is of long duration, should be treated by the psychiatrist. The man with occasional impotence can be treated by superficial therapy as described in the section on frigidity. The physician can often obtain gratifying results with suggestion in those whose impotence is temporary. If he is skilled in hypnotherapy, he can, by re-education and reassurance, establish confidence, with subsequent maintenance of an erection. This can be reinforced by repeated posthypnotic suggestion. Schrenk-Notzing[21] reported many forms of impotence treated by hypnosis. Erickson[22] has treated premature ejaculation by reversing the fear of too rapid ejaculation. He orients the patient in the hypnotic state to the idea that he will not have an ejaculation rapidly enough or that ejaculation with orgasm will be retarded. He also utilizes the good hypnotic subject's ability to distort time. Through time distortion, 10 seconds of subjective or experiential time is equated to one minute of actual time. Thus, if the man who ejaculates prematurely thinks he can wait for what seems to be three minutes of subjective time, it will seem like 18 minutes of actual time. He will soon develop a feeling of confidence. Time can be similarly distorted or speeded up for women who are married to men suffering from premature ejaculation. The women can be told during hypnosis that 10 seconds of actual time can equal one minute. If the husband's ejaculation occurs in four minutes, for instance, the woman will think it has taken 24 minutes. The healthy partner should not, as a rule, be informed of such therapy.

Hypnoanalysis also has been employed for refractory cases of impotence. However, treatment of these patients is a difficult, tedious, and at times painstaking procedure, which must be carried out by psychiatrists. General practitioners must know their limitations in the psychotherapeutic approach to the problem of impotence, lest they do more harm than good.

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The Joy of Leisure

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Loafing is the last shred of Paradise left us. For the trivial pleasure of nibbling the apple, Adam condemned us all to a life of ceaseless toil, in which the art of loafing has been lost. In Andalusia, Spain (very near where I was born, which makes me an authority on the subject), loafing has been raised from a mortal sin to a holy virtue. Andalusians have been trying for thousands of years to recover the lost art of loafing. Blessed with a land caressed by a golden sun and gentle breezes, they have simply replaced our way of life, with its maximum efforts and pressures and recreation feverishly concentrated into single instances, by a life in which instead of increasing the *assets* they reduce the *liabilities*, living with a minimum of effort and a minimum but continuous recreation, perhaps because they feel that it is better to have a little fiesta all the time than a big fiesta once a year.

But for us who live in countries where speed is almost synonymous with professional conscientiousness it is impossible to replace exerting all our efforts so as to live by living only to exert no effort. We must therefore seek other solutions to our problem of how to reconcile *otium*, the hours of respite from the pressures of life, with *nec-otium*, the negation of rest and recreation that our work represents.

Man is the only creature on earth that needs to *di*-vert himself, that is, to cut himself off from what he is normally and become somebody else for a while, to escape his everyday personality as a physician, writer, carpenter, or mechanic, and change, somewhere else and for a certain length of time, into traveler, reader, fisherman, or golfer. This temporary occupation with which we fill our leisure—hunting in the highlands, fishing on the high seas, climbing mountains—is often more tiring than our normal life, but excels it in having an added dimension, that of being a happy occupation, for the desire to be happy is common to everyone.

The problem of man's recreation is important because it throws a light upon the state of mankind. There is no better way of knowing people than by studying how they amuse themselves. Of the three points in life's triangle—work, rest, and recreation—two are oppressively monotonous because they never vary: work (healing patients, writing books, breaking stones, sewing clothes) and sleep. "Serious" activities are similar everywhere, since life compels us to fulfill them. Only when a man allows himself to dream and tries to be happy in his leisure are the differences between him and other human beings revealed. Our dreams are the personal trousseau we bring into this world.

Mankind's recreations reveal two types of periods in history: one, like the "Gay Nineties," is when people are more concerned with seeking pleasure than with avoiding pain and therefore pay higher prices to entertainers than to physicians; the other—and this applies to our present aspirin age—occurs when there is greater concern in eliminating anxiety and pain by means of melancholy drugs than in

actively seeking happiness. Today we have excellent hospitals but very little good theatre. We keep on discovering new ataraxics and analgesics but monotonously repeat our theatrical and literary fare. For treating our ills nothing less than the latest antibiotic will satisfy us, but we still sit through plays where the wife is unfaithful to her husband with his best friend just as she was a hundred years ago.

In this country we often fill our leisure with a hobby. I do not believe in making a fetish of a hobby—golf, chess, philately, or canary-breeding—for if such a pastime means so much to us, we ought to realize our true vocation and devote our whole life to it. But a hobby often reveals a person's real spiritual stature. The range of human activities is remarkably limited and boring; what distinguishes us from other people is not what we do but how we occupy our free time. In this sense no two physicians are identical in the way they spend their spare time, even when they engage in passive and even numbing pastimes such as watching television.

Reducing to a simple equation the problem of what man does to occupy his leisure, I would say he does one of two things: he escapes into nature or he escapes into himself.

Some people return to nature during their leisure, perhaps because subconsciously they feel that man is a fugitive from nature. Man fled *from* nature into history, from nature, which is above all physical space and where things—birds flying, fish swimming, flowers growing—happen only in a fragment of this planet, and *into* history, which is eminently time and where man does things in a time dimension. It is thousands of years since man ceased to be a child of nature to become a maker of history through his ideas, his toil, and his professional activities. Hence he often feels a desire to return to nature, to become a natural being once more and do the things—hunt, fish, swim, chop wood, or picnic in the woods—that will give him back the pristine happiness of his primitive condition.

And other people escape inward, into the spirit, into that intimate self lost in the daily anxiety to get things done as quickly as possible. Man began by being nature, but essentially he was spirit. Both aspects of his personality, the physical or natural and the spiritual, have been diluted, particularly in the world of concrete and neon lights. Vanished are the two precious kingdoms—that of nature and that of the spirit—in the struggle to perform the daily tasks, be it doing things with the hands or using the mind to apply the knowledge accumulated. Man's other escape during leisure hours is therefore toward the spirit through meditation, music, reading, writing, or even the lost art of conversation free of all professional topics. When in such moments of leisure man finds himself again, he feels the same joyful shock that he would feel should he enter the depths of a dark mine—his own spirit—and suddenly stumble upon a heap of rare gems sparkling in the darkness.

Nature and spirit are therefore responses to the problem of man's leisure. Nobody knew better how to reconcile these two than the Greek philosophers, masters of the art of good thinking and better living, who in the shade of the silver-dappled olive trees, as in Plato's *Symposium* (presided, by the way, by a physician), could discuss philosophy for hours while the amber-toned wine gurgled down their learned throats even more merrily than the cicadas chirped in the branches overhead.

These two gateways to nature and the spirit are still open to modern man, but

it is not enough to escape into these kingdoms only during idle hours. One must learn to live guided by two capital rules so simple that they have been forgotten: to preserve an inner calm even amid storms, as did the halcyon in the very center of the cyclone, according to the legend; and to have always a little fiesta—sense of humor, *joie de vivre*—in that sunlit little corner of Paradise that we all carry in our heart.

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BOOK REVIEWS

The Leukemias: Etiology, Pathophysiology, and Treatment. Edited by JOHN W. REBUCK, FRANK H. BETHELL, AND RAYMOND W. MONTO. New York, Academic Press, Inc., 1957. Pp. 711. Price $13.00.

This is the record of an international symposium held at the Henry Ford Hospital in March, 1956. It consists of 39 separate but integrated papers on diverse aspects of leukemia—cell structure and immunohematology, genetic and environmental factors, radiation effects, physiology and biochemistry of leukocytes, and mechanisms of drug reaction and resistance. Each group of papers is followed by the transcript of discussions by those in attendance. Most of the contributors are investigators. Emphasis is on the theoretical and research aspects rather than on the immediate problems of management of cases.

Lectures on Antibiotics. G. F. GAUSE. Ed. 3. Moscow, 1956. (Present Polish Edition, printed in 1958, includes additions sent in by the author in 1957.) Pp. 344.

The book is based on a series of lectures delivered at the University of Moscow and it consists of two parts. The first is devoted to studies of antibiotics and is a review of current literature on the properties of antibiotics. The second part consists of a summary of theoretical problems and clinical studies in connection with the study of antibiotics from the point of view of ecology, physiology, and the biochemistry of microorganisms. While preparing the book, the author had the advantage of being able to consult many scientists in various parts of Russia who are working with antibiotics. In this connection, at the end of each chapter there is a short bibliography of the original works containing particulars of methods.

The chapters in part one include studies of penicillin, other antibiotics produced by fungi, streptomycin, chloramphenicol, tetracycline, other antibiotics produced by *Actinomyces*. Other chapters in part one discuss antibiotics produced by bacteria and by plants and antibiotics from animal tissue.

Some of the problems discussed in part two include antagonism of microorganisms, a chapter on ecological and geographical distribution of antibiotic-producing organisms, the growth of resistance of microorganisms to the action of antibiotics, the mechanism of antibiotic action, as well as a chapter on optical activity of antibiotics, which relates the activity of their molecules to principles of their antibiotic action. Biological methods of nomenclature as well as side reactions of antibiotics are also discussed. In general, the facts are presented systematically, and this could be a good reference book for students of biochemistry and microbiology, if it were not for the language barrier.—*Miriam W. Edelstein*

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